Problems of Education in the 21st Century,
ISSN 1822-7864 (Print) ISSN 2538-7111 (Online)

Vol. 81, No. 3, 2023

PROBLEMS OF EDUCATION IN THE 21st CENTURY

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- EBSCO: Education Research Complete
- Education Research Index Database Coverage List “Core” coverage
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Publisher

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Index Copernicus (IC™ Value): 100.00 (2021); ICDS (Secondary Composite Index Broadcasting): 9.5 (2018). CGIJ OAJI: 0.600 (2022). H Index: 9 (2022), Journal Citation Indicator (JCI) / Clarivate: 0.38 (2021)

Problems of Education in the 21st Century is an international, periodical, peer reviewed scientific journal, issued by the Scientia Socialis Ltd. in cooperation with SMC „Scientia Educologica".

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WHICH TEACHERS SHOULD BE REPLACED BY AI

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Teaching complex, abstract content is the key foundation of our civilization. Even before Internet there were technologies which thus significantly improved teaching and learning process and accelerated development of human society. With Internet and digital technology a number of new, powerful technologies are available to education. They significantly change the role of the teacher. No teacher can provide data, information, explanation, discussion or advice that cannot be found online nor can do it better than someone already did, or will do online. However, instead trying to do all for all, modern teacher should focus on doing something particular what they excel in for a fraction of students who truly need that teacher. Due to Internet the quantity of that small fraction of students will be larger than ever. Schools also need to transform, both physically and institutionally. Physically they need to provide spaces and resources for collaboration and exploration as well as cohabitation with their teachers. Institutionally they will specialize for some aspect of educational process from creation of new knowledge, its curation to its assessment.

Recently Artificial intelligence (AI) (Kelley, 2023) has created huge attention both in professional and general public. This is not the first time, similar hypes have been raised in ’70-ies and late ’80-ies but this time, with Internet and wide area of possible applications, many professions are concerned about their future. Teaching is one of them, as well. Thus the question “Which teachers should be replaced by AI?” is neither inappropriate nor inflated.

Use of Technology in Teaching

Ability of human beings to communicate complex thoughts is the foundational building block of our civilization and our ability to subdue all other species and conquer the nature. Our ability to teach others and our offsprings abstract concepts in addition to practical ones differentiates us from all other living species we know and accelerates societal development. We are able to learn from other individuals’ experience. Inventing technology which can be used in teaching and learning has additionally enhanced the process of technological and societal development.

Pre-internet Technologies

Literacy is a huge milestone because it enables us to overcome spatial, but even more important, temporal limitations of oral teaching. Printing technology immensely boosted scalability of teaching because written knowledge became available to masses. Schools standardized workforce as a cornerstone for industrialization and mass production.

https://doi.org/10.33225/pec/23.81.296

ISSN 1822-7864 (Print) ISSN 2538-7111 (Online)

Internet

Internet has brought dissemination of knowledge almost to its limits. Faster it would be only if we could have direct connection of our brains with this immense storage of mankind's accumulated data, knowledge and experience. Internet enables anyone to access any knowledge, any time, any place thus enabling every individual to boost their performance when and where needed.

But the key property of Internet is that it enables just anyone to contribute to that huge common storage of accumulated civilization's intellectual wealth - knowledge. Everyone can contribute data. Everyone can contribute their interpretation of their own and other peoples' data thus creating information. And everyone can contribute their explanation of causal relationships, rules and logic thus creating knowledge.

Multimedia

Since the advent of civilization humans were using drawings to explain things. Ability to make photographs, movies and record sound have been around for about 100 years and many educators experimented with their use in teaching and learning. However, it is their digital version, ease of production and dissemination over Internet that makes them extremely popular and very useful educational technology.

They are so popular that some educators, rightfully, fear that students will dangerously neglect use of written knowledge. "A picture is worth thousand words" is popular proverb that comes to mind when usage of multimedia in education is planned. However, there is no hierarchy of multimedia elements, not in the sense that one is better than the other in all situations and applications.

It is crucial to understand properties and benefits of each of multimedia components. Written text, spoken words, sounds of nature, artificial sounds, drawings, animations, photographs and video each have their own benefits as well as drawbacks in teaching and learning wide range of topics. Therefore they should be carefully chosen and meticulously applied.

Modelling and Simulations

Fast computing and huge data sets enable better understanding of natural and social phenomena and predict future events and results of human interventions with probability never possible in history of mankind. From meteorology to financial markets, from machine building to agriculture, to epidemics, to taxation it helps in learning, planning and execution of human actions.

Extended Reality

"Extended reality" (XR) is the joint term for "Virtual reality" (VR) and "Augmented reality" (AR) (Limbu, 2020). Virtual reality uses multimedia to depict to the user essential elements of space, time and knowledge in a graphical way with hope to make it easier to comprehend and use.

It enables creating of virtual laboratories, among other applications, furthering the scalability of learning by enabling masses to learn and research anytime, anywhere, in a safe, limitless way without any proportional cost. It also enables creation for spaces not available in reality or anticipated spaces people have yet to reach or discover.

Augmented reality overlays virtual reality elements on video and audio of real world in real time assisting the user in comprehending and manipulating real world. It can tremendously improve human's performance in mission critical situations like medicine, rescue operations, explorations etc. Extended reality can train and prepare professionals and common people for their future engagement in an unprecedented way significantly reducing risk, mistakes, injuries, reducing cost and boosting their performance.

Artificial Intelligence

Since the advent of computers it seems that the moment of creating a machine as intelligent as a human being is in the reach. Several times in recent history there were media hypes announcing "thinking machines". Recently, a vast range of machine learning algorithms have been developed and tested in use in a variety of applications and now enormous corpus of human knowledge is used to train them in attempt to enable computers to reason the way humans do. Both professionals and layman are arguing whether this new technology is intelligent at all.

It is a fundamental question whether we can create machines comparably intelligent to human beings before we actually know how human mind works (Mitchell, 2021). It is still unclear what role our emotions play in cognitive processes.

However, regardless of these fundamental questions, it is indisputable that a number of cognitive jobs, previously reserved for humans, machines already can or will be able to do in the near future. Everything that can be reduced to a mere logic and/or set of rules can be done by a machine, now or soon. Thus, almost all professions, occupations and jobs rightfully have to think about the future of their job descriptions. Teachers likewise.

It is hoped, at least by the AI enthusiasts, that AI will be able to summarize knowledge, explain it, discuss, even argue. These all used to be essential roles of a teacher. If these projections come true, what remains to be the role of a teacher, if anything?

Teacher`s Role

Teachers exist as long as humans do. First teachers were parents and elderly in a tribe. Teachers as a profession came much later and their role was primarily to give information, especially in the age when teachers were likely to be the only literate person in a local community.

With the dawn of industrial revolution, teachers had to explain knowledge, rules, procedures and train standardized workforce. Their primary role was to form. To form an individual into a standardized, reliable working machine with more or less intelligence.

With machines taking over most physical work, jobs for humans require ever growing intellectual effort, coping with unplanned and unforeseen situations and tasks. Education and teachers have to adjust their role to it. Many argue how well and how promptly they have been and are adapting.

And now, with AI's potential to take over even many of these intellectual jobs, many are confused as to what jobs will be left for humans. It is no wonder that teachers who need to prepare future workforce for those jobs, or so we think, are confused even more.

This is a double dilemma. Do they need teachers at all? And if they do, what and how should teachers teach?

Because, teachers' role and job has not essentially changed from the beginning. Most teachers still do what and how their own teacher did, and teachers of their teachers.

Speaker

Teacher's profession is predominantly associated with giving lectures. And in doing so, most teachers predominantly convey information: data and interpretation of data. Many times this is not even their own, personal interpretation of data but rather somebody else's interpretation.

In the ripe era of Internet, what data can a teacher serve to their students that students cannot find by themselves on the Internet? Find them anytime, anywhere. And diverse data, controversial data. Which interpretation they cannot find? And they can find this data and interpretation in any modality: text, sound, image, video. And use it from the author that suits them most. So why would any student need a lecturer? Especially the assigned, given, predefined one, as opposed to chosen, speaker at the predefined time and place?

The only reason is because the interpretation is either novel or specifically crafted to student's personality, task or state of mind. And even then maybe it should not be in person, both student and teacher being in the same place, but rather remotely. And even then, maybe it should not be conveyed synchronously, student listening while teaches is talking, but rather it could be recorded. In that way teacher's contribution would be available to the student in a way that suits them most, but it would also be available to many students, worldwide and timelessly, forever.

Thus the role of a teacher as lecturer should be to provide a specific information in a specific way, an added value no one else has provided and to offer it in a scalable, timeless form.

Content Creator

Historically, another educational technology was the textbook. A book intended specifically to assist students to acquire knowledge. Sometimes they are created by practicing teachers, but not always. Often they include content intended for students to practice new knowledge as well as to test how well they increased their competence. In other occasions these other, supplemental content was formed as separate publications.

Today technology enables creation of a variety of educational materials: tutorials, explanatory material, exercises, assessment tools etc. (Pale, 2002). Each of them can use most appropriate technology. In addition, each type can be prepared in multiple variations for specific audiences. For example, a textbook teaching programming in a specific programming language for complete novices in programming should be substantially different from a textbook intended for experienced programmers in some other programming language.

Furthermore, there is a vast source of educational content that is "fragmented": not in a form that is complete in a sense of a book or other printed or electronic counterpart. There is a plethora of short explanations, tutorial, exercises, tests etc. in the form of a text, illustration, audio, video or computer program. Modern teacher thus does not need to compete with existing educational materials, but rather be the selector, advisor to students which of the existing materials are most suitable for his students.

If a modern teacher feels competent and attracted to being a content creator, they should carefully define the audience of their content, the desired outcome of usage of their future content and how it will differ from existing content for the same audience and same purpose. Thus they will create a valuable piece for the whole puzzle of educational materials which can become a droplet in a future cocktail created by some other teachers for their students.

The advantage today is that one does not need to create the whole textbook or any other educational material in complete, but can rather create just one chapter, example, illustration, demonstration, section or whatever piece of knowledge or educational content. Thus it can be created on the go, incrementally, at the spur of a moment or inspiration.

Director

Traditionally, students enroll in an educational process based on curricula and individual courses are learned according to a specific syllabus. Both, curriculum and syllabus are created in general, intended for a wide variety of students who will subsequently use the knowledge in a variety of jobs and situations. But, modern economy requires lifelong learning which requires adjustable learning process, education tailored for the individual, small group or project.

In order to tailor it, the specific outcomes of the education, existing knowledge and gaps of student(s) as well as situation, resources and other factors need to be taken into account when designing the educational process. In this task, emotions, culture, individual and organizational values and other non-subject and non-cultural elements play important role. Thus this is the task only humans are able to complete satisfactorily.

The educational "director" is a kind of new educational profession that might emerge serving individuals, small groups, organizations. In depth understanding of topics that students need to acquire, vast practical experience, broad knowledge and experience are crucial for this job. This role also assumes the role of a mentor: the one in charge of overall development and advancement of future professional as a holistic member of a prospering society.

Supporter

Despite ever growing corpus of educational content and diversity of educational materials available on-line, most of them free, a student will have the need for assistance. Sometimes to choose alternative educational material, sometimes to fully comprehend, sometimes to discuss and challenge opinion, sometimes to understand practical implications and learn from others' experience.

One way to accomplish that is through conversation with other students, experienced professionals or teachers. There is a plethora of discussion groups and fora on Internet that can be used. One can also engage in one-to-one discussion with willing individuals world-wide. Thus the "classmates" and "faculty" are broadened to the whole living population.

Learning partners, consultants, coaches are all available on-line, immediately, every time and all the time they are needed. This is something no teacher and no school can offer and compete with. Because a physical teacher has a very limited offer: only his own competence and only sometimes.

But this limited, personal offer can be for a never before possible number of students: worldwide population. They can offer their competence, which includes their experience – professional, educational and life experience - to almost unlimited number of people in the whole world.

However, they are going to face a strong and growing competition in the form of artificial intelligence. AI systems will aggressively assume that role. They will integrate every answer, advice, opinion and suggestion anyone ever gave and offer aggregated support to the learner.

It does remain to be seen to what extent students of all sorts will be satisfied with AI service and whether its influence on the competence of future professionals will create significant and possibly worrying "holes" with possible dangerous outcomes in professionals' products and services.

However, it highly probable that "personal AI" systems might be created. A professional, a teacher, could feed a dedicated AI system with their own knowledge, experience and values in written, spoken, visual form in the hope that such a system would be capable of giving answers as close as his live counterpart, the "father" could. This could become a form of immortality of a teacher. This calls for teachers to leave their legacy in multiple forms and in many details, to "transcribe" themselves in digital format as broad, as deep and as versatile as one cannot even imagine today.

As AI technology will progress, "teacher's digital transcript" could become THE way of teaching. Instead of trying to be a good teacher to everyone in local audience, teacher's role should be to become the best teacher to a specific audience, worldwide and forever.

School Role

For a couple of centuries the school was the place to learn. It is where the corpus of knowledge was homed and process of knowledge transfer was occurring. This can no longer satisfy the needs of contemporary and future societies, organizations, economy, students and citizens.

Data and information are homed in Internet. There are many sources of competences today: organizations, individuals, groups. Also, everybody is, in one moment or another, in one form or another a student. Learning has to be available here and now. For student's purpose with student's desired outcome. Thus, a legitimate question becomes: "What is the future role of the school?"

Physical Space

People will utilize on-line and virtual presence to make their learning as efficient as possible. However, for ultimate result, for ultimate learning outcomes and for fruitful, joyful life, learners need each other physically. People are social beings. They need physical presence of other humans. Collaboration is the key element that enabled the creation of such a complex and advanced civilization.

The school is the place to meet these social needs. However, this also means that physical space of schools needs to transform. Large groups of students listening to unidirectional talks in the same room in the same time will become extremely rare. Students need small spaces for their project based collaboration, pleasant environment for their stimulating discussions, cohabitation spaces where they learn tacit knowledge form the masters – their teachers.

Students also need physical spaces for learning and experimenting that cannot be found elsewhere. They need a safe physical "sandbox" to test in real life what they have researched and experimented with in virtual laboratories and virtual spaces. Learning can no longer be a unidirectional process, from teachers and school to students. It became omnidirectional process where not only teachers learn from and with students, but also where school learns from industry and society.

Institutional Role

Learners are everywhere. The need for knowledge transfer is everywhere. There needs to be a focal point. It will be the school. The school needs to be a kind of information clearing house, a referral point, a broker. A first point of reference to find knowledge and educational process, to express needs, the medium to communicate newly created content and services.

This also means that the time of universal schools is mostly gone. Some will be specialized in knowledge assessment and certification, some will focus on curating the knowledge and others will assume roles we cannot even comprehend today. And yes, some schools will be physical spaces while some will be virtual only. And a range of combinations, of course.

Summing-up

Defining one's role as a teacher in the future is an uncertain task. A teacher should clearly and realistically identify their strengths but also their true passion. Be it creating the content, explaining, telling stories, sharing experience, working on projects, assessing competences or else. And then, one should focus on doing it to the best of their ability.

Instead of trying to be a good teacher in everything traditional teacher was doing and to every student, modern teacher needs to excel in what they do the best and focus on those students needing them most. To be the best teacher only to some. Due to Internet, one can be the best teacher to incomparable number of worldwide students, forever, instead of being satisfactory teacher only to a few local students, now.

Note

This editorial was prepared based on the keynote speech delivered at the Vth International Baltic Symposium on Science and Technology Education, BalticSTE 2023, June 12-15, 2023, Šiauliai, Lithuania. It was approved by the Symposium scientific committee.

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Received: *April 25, 2023* Revised: *May 25, 2023* Accepted: *June 08, 2023*

Cite as: Pale, P. (2023). Which teachers should be replaced by AI. *Problems of Education in the 21st Century*, *81*(3), 296-302. https://doi.org/10.33225/pec/23.81.296

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MATHEMATICS AND SCIENCE TEACHERS’ PERCEPTIONS OF THE FACTORS INFLUENCING TEACHING AND PROFESSIONAL IDENTITY

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Abstract

Professional identity has a significant impact on teachers' interpretation of their different roles and their understanding of how to perform these roles. This study aimed to explore mathematics and science teachers’ perceptions of the factors influencing their teacher professional identity within three dimensions: teaching efficacy, teaching profession, and teaching context. Mathematics and science teachers (N = 395) who were teaching in grades 5 to 12 participated in the study. To address the research aims, we administered a questionnaire to gather information on the factors influencing teacher professional identity. The quantitative data on the teachers’ perceptions of the factors influencing their teacher professional identity showed that the teaching efficacy dimension ranked the highest, the teaching context dimension ranked second and the teaching profession dimension third. The teachers’ perceptions were largely influenced by three main factors: years of teaching experience, gender, and school location. The teachers’ responses to the questionnaire’s open-ended questions highlighted some issues related to the quality of the professional development programs available to teachers.

Keywords: *teaching professional identity, math teachers & science teachers*

Introduction

The Concept of Identity

The concept of identity is a significant psychosocial factor for studying teachers’ personalities. The term *identity* reflects the developing connection in a person where all inner and outer forces converge: the mystery of personality, the nature of humanity, the culture in which an individual was brought up, and lived experiences (Beijaard et al., 2000). Ghanizadeh and Ostad (2016) indicated that identity can be viewed as a "fluid, dynamic, recursive, and discursive process in which statements about actions are translated into statements about states, and vice versa" (p. 831).

In the teaching context, professional identity is defined as a reflection of the developing knowledge of the subject matter that teachers teach, in the many beliefs and values involved in their relationships and interactions with students, and in the efficacy of their teaching practices for students' outcomes (Beijaard et al., 2000; Sener, 2015). Palmér (2016) claimed that teachers’ awareness of their professional identity - as it affects their self-motivation, self-organization, and job satisfaction - has an impact on the interpretation of their various roles and on the perception of how to perform these roles. It also influences teachers’ actions regarding the design of lesson

https://doi.org/10.33225/pec/23.81.303

plans, the implementation of strategies, the assessment of the learning process to enrich and improve the curriculum, and the communication and collaboration with others (Cyrino, 2016; Dalby, 2017). Chong et al. (2011) argued that understanding a teacher's professional identity is an ongoing process that requires studying the impact of policy and social opportunities on perceptions of quality teaching, examining the influence of school context, and exploring the main factors that impact the individual's sense of professional identity.

Research-Based Theoretical Foundations

Different studies have shown that teachers' professional identity is connected to different individual components such as motivation, confidence, and self-efficacy. Hanna et al. (2020) argued that motivation, self-efficacy, self-image, and task perception are factors affecting teacher’s professional identity. Educational programs in particular should be aware of the personal, relational, and contextual factors that can influence the growth of teachers’ professional identities. Steinert et al. (2019) claimed that faculty professional development programming can play a critical role in enhancing and strengthening the professional identities of teachers. Van der Wal et al. (2019) indicated that affective appraisal and behavioural responses such as "reflective action, support seeking, help-seeking, and directive action" can help to understand how professional identity tensions impact early career teachers.

Teachers’ awareness of their professional identity also has an impact on their interpretation of their various roles and their perception of how to perform these roles, improve the curriculum, and communication and collaboration with others (Ennerberg & Economou, 2021). The studies that have explored the development of teachers’ professional identity reveal that the perceptions of teachers regarding their professional identity affect their teaching efficacy, their professional development, their propensity to stay in the teaching profession, and their ability and willingness to enhance their teaching performance and cope with educational change (Chong et al., 2011; Wagoner, 2011; Beijaard et al., 2000). Korthagen (2004) indicated that studying teachers’ perceptions of their professional identity may widen researchers’ understanding of what enhances the quality of teaching and may add validity to research into the role of teaching pedagogies in enhancing the quality of learning experiences Chong et al. (2011) highlighted the need to study the correlation between the various components that shape individual perceptions of teachers’ professional identity, such as knowledge, teaching values, pedagogical practices, and citizenship behaviour.

Ahmad et al. (2019) argued that the concept of teacher professional identity has currently emerged as an important factor and can have a significant effect on teaching and learning outcomes. They add that scholars and researchers should take more consideration to explore and identify factors that have the potential to contribute to professional identity development. Many factors shape professional identities, such as the impact of policy and social expectations, the effectiveness of the school context, and the influence of personal, family, and societal roles (Chong et al., 2011). Ahmad et al. (2019) indicated that studying the development of teachers’ professional identities is influenced by the following three considerations:

(1) "the socio-cultural context, which affects teacher beliefs, perceptions, and teaching practices; (2) the nature of teacher learning; (3) general beliefs about the teacher’s role and institutional goals; and (4) the different research methodologies that will be applied to conceptualize the complexity and multiplicity of teacher identity" (p. 8).

Cardoso and Costa (2016) also reported that in terms of influencing professional identity and satisfaction with their career, teachers value the role of satisfying personal factors in the profession; however, the researchers reported that crowded curricula and poor working conditions negatively affect satisfaction levels in teachers.

The results of a study by Shaalvik and Shaalvik (2015), which was based on interviews with four retired teachers and thirty in-service teachers, showed that the main challenges and sources of anxiety in the teaching profession were related to "workload and time pressure, adapting teaching to students' needs, disruptive student behaviour, value conflicts and lack of autonomy, teamwork, and lack of status" (p. 184). Gracia et al. (2019) studied the beliefs of 279 technology and science student teachers from 2014-2018 regarding the development of teachers' professional identity and its construction. The results of their study highlighted the importance of the connection between teachers' perceptions regarding their professional identity and the improvement of their pedagogical knowledge and skills linked to socio-educational aspects.

Currently, the topic of professional identity is receiving renewed attention from researchers, particularly in terms of the increasing level of expectations on teachers in different pre-service and in-service communities, along with the changing roles of teachers in schools in response to social forces (e.g., Ennerberg & Economou, 2021, Gracia et al., 2022). The focus on teachers' professionalism in recent studies has moved toward greater emphasis on discussing professional identity and the requirements for its optimization such as strong intellectual abilities, negotiating complex social interactions, extensive specialized preparation, and a supportive social life (Gracia et al., 2022; Steinert et al., 2019). Clarke and Hollingsworth (2002) claimed that improving teachers' professional identities requires changes in teachers' norms, concepts, perceptions, attitudes, knowledge, pedagogical practices, and the quality of student learning outcomes. Tsybulsky and Muchnik-Rozanov (2019) studied the process by which the professional identity of 17 student teachers was shaped while team-teaching science classes using a project-based learning (PBL) approach. The results, based on in-depth interviews as well as reflective reports, showed that the student teachers' professional identity was gradually changed as a result of supervising the PBL sessions and collaborating effectively with their co-teachers. The researchers also claim that identity formation is enhanced through the process of overcoming challenges through reflective social experiences with peers who support their professional and personal growth and enhance their self-confidence. Olsen and Anderson (2007) studied the reasons for entry into the teaching profession and the main factors for staying or leaving the profession 15 new teachers in urban Los Angeles. The findings indicated that teachers' pre-service programs greatly shaped their initial motives for admission. The results also highlighted the need to improve several educational practices inside and outside the classroom, increase receive professional support, and improve workplace conditions in order to strengthen their professional commitments.

Coldwell's study (2017) aimed to explore the relationship between teacher professional development programs and professional identity based on the results of a survey of the perceptions of 500 teachers and interviews with 25 teachers. The results showed that the main factors influencing identity are the quality of professional development programs, the organizational support and school culture, and individual factors such as motivations for engagement in professional development, career stage, and family issues. Symeonidis's (2015) study, which was commissioned by Education International (EI) in the UK, aimed to examine the voices from 73 member organizations in 55 countries in order to understand the main influences affecting teachers' professional identity and promote the teaching profession. The findings from Symeonidis's survey indicated that "teacher status is related to aspects of quality education and, more specifically, to socio-cultural and economic contexts, job security, salaries, and working conditions, teachers' professional development, representation of the teaching profession, professional autonomy, social dialogue, and involvement in decision-making" (p. 10).

Ambusaidi and Al-Balushi (2012) studied the perspectives of supervisors of science, physical education and Arabic education teachers concerning the level of professional identity that they possess. Their study revealed that teachers should have ongoing opportunities for developing their professional identity through quality professional development programs. In 2017, Ambusaidi and Al-Farei conducted a study to explore the attitudes of 139 randomly selected science teachers in grades 5 to 10. In terms of classroom preparation, facilitating hands-on science lessons, and offering developmentally appropriate interventions the teachers' attitudes toward their teaching practices were strongly positive or positive, and gender and experience were statistically significant factors for the differences in the teachers' attitudes toward teaching science. A problem with these studies according to Ahmad et al. (2019) is that researchers often differ in their interpretation of the concept of teacher professional identity, and their opinions vary regarding how to measure it. These differences occur due to three diverging research approach reasons: first, some researchers are interested in studying the concept of teacher professional identity through teacher self-evaluation of their roles, ideas, and self-concepts in the teaching and learning process; second, others are interested in studying the concept by studying teachers’ awareness of their roles, and third, some researchers are concerned with studying the professional identity of teachers by measuring the relationship between teachers’ roles and their social life. Since these three research approaches discussed by Ahmad et al. (2019) lead to distinct but complementary insights into professional identity, studying the integration of these aspects may provide new dimensions in understanding this concept and the variables associated with it.

Based on findings from a national study (Ministry of Education [MoE], 2012), the MoE concluded that quality student learning outcomes are dependent upon teachers’ skills and meaningful support from school management. Similar findings were obtained from a report that was jointly prepared by the MoE and the World Bank; they found the main difficulties facing the Omani educational sector are how to develop student learning outcomes and enhance the quality of teaching (MoE, 2012). In recent years, the MoE has collaborated in many international studies to evaluate the progress of schools in mathematics and science (e.g., TIMSS 2007; TIMSS 2011; TIMSS 2015); and gauge the quality of education programs for teachers (e.g., the Teacher Education and Development Study in Mathematics (TEDS-M)) in 2008. The results of the studies emphasized the central significance of enhancing schoolteachers’ professional knowledge and practices to improve overall students’ learning outcomes, and specifically science and mathematics outcomes.

Research Aims and Questions

This research aimed to explore mathematics and science teachers’ perceptions of the factors influencing their professional identity as teachers. Hence, two specific research questions were formulated as follows:

- With regard to the dimensions of *teaching efficacy*, *teaching profession*, and *teaching context* - what are mathematics and science teachers’ perceptions of the factors that influence their professional identity?

- What are the differences in mathematics and science teachers' perceptions of how the following demographic variables - *years of teaching experience*, *gender*, *school location*, *educational degree*, and *specialized subject* - influence their professional identity?

Research Methodology

General Background

The research adopted a mixed-methods design where both quantitative and qualitative methods were used. The reason for integrating quantitative and qualitative research tools was to obtain a more comprehensive picture of teachers' perceptions regarding the factors affecting their professional identity. The data was collected using a teacher's professional identity scale questionnaire items and an open-ended question. For the quantitative part, participants were given a questionnaire containing Likert scale questions. We used the scale to explore the mathematics and science teachers’ perceptions of the factors influencing their professional identity. For the qualitative part, we obtained the data from an open-ended question that focused on exploring teachers' experiences and the impacts of these experiences on their professional identities.

This study is in line with the main objectives of the MoE, which are to enhance the quality of teaching and student learning outcomes. The education system in Oman includes both public (grades 1-12) and private (preschool to grade 12) institutions. Public school education includes two stages, Basic and Post-Basic Education. Basic education (grades 1-10) is divided into two cycles, Cycle 1 (Grades 1–4), where male and female students are taught in the same classes, and the teaching staff are completely female; and Cycle 2 (Grades 5–10), where students of both sexes are taught in separate schools, and in most schools, males teach male students and females teach females. The Post-Basic Education stage is for students in grades 11 and 12 and requires male and female students to study in separate schools. The MoE is interested in achieving high educational standards and developing teaching practices by enhancing the professionalism of teachers. Studying the factors that impact teachers' professional identities has become a significant strategy to enable ongoing educational reforms in terms of teachers' beliefs, attitudes, and pedagogical practices. By studying teachers' needs, expectations, and levels of commitment, this study may offer new insights to help develop teachers’ professional identities. In the Omani context, there is a lack of studies on professional identity; therefore, by examining the perceptions of mathematics and science teachers in this study, we hope that a greater understanding may be possible of the main factors that influence teachers’ professional identities.

This is the first study in this context that has explored factors influencing teacher professional identity that fall within three dimensions: *teaching efficacy*, *teaching profession*, and *teaching context*. Thus, the findings may lead to a better understanding of the factors that influence teachers’ performances on the one hand and to opportunities to evaluate the design and ongoing management within educational institutions on the other.

Sample

For the quantitative data, 395 mathematics and science teachers teaching in public schools were selected according to a convenience sampling method from three educational governorates. Convenience sampling is a type of sampling method to select participants from the target population who meet specific criteria related to geographical proximity, affordable availability, willingness to participate, and the homogeneity of the target population (Etikan et al., 2016). The most well-represented group in the study sample is teachers with more than eight years of teaching experience and those with a bachelor's degree in mathematics or science, as they represent the largest number of the study population. In addition, the schools were selected from three governorates in order to ensure that there was diversity among the participants in terms of their demographic characteristics such as years of experience, academic degrees, gender, and scientific specialization. Table 1 describes the distribution of our research sample by demographic factors.

Table 1
The Research Sample Demographic Distribution

Demographic Data/ factors		Frequency	Percentage (%)
Years of teaching experience	1-4	55	13.9
	5-8	114	28.9
	> 8	226	57
Gender	Male	131	33.2
	Female	264	66.8
School location	AlBat	164	41.5
	Alda	134	33.9
	Alsh	97	24.6
Educational degree	Bachelor	348	88.1
	Diploma	27	6.8
	Educational Diploma	20	5.1
Specialized subject	Science	194	49.1
	Mathematics	201	50.9

Instrument and Procedures

After obtaining permission from the Oman MoE (the permission number is 2818242062) and the schools' principals, we selected the sample for this study. The data collection process took place in each school during a scheduled meeting. First, the participating teachers were informed before the meeting that a study would be conducted to examine their perceptions of the factors influencing their professional identity. During the interview, the purpose of the study was explained. The importance of their opinions as teachers in understanding the factors affecting their professional identity was also emphasized, and the components of the questionnaire and the response options were clarified. We explained to teachers that an open-ended question provides space to add opinions, suggestions, and other perspectives from their experiences, particularly those related to the teaching profession in general and teacher roles in particular. Then, the research instrument was administered during the meeting.

A questionnaire called the Teacher Professional Identity Scale (TPIS) for measuring teachers' perceptions of the factors influencing professional identity was developed for mathematics and science teachers by investigating several teacher professional identity instruments that had been developed both generally and within the Oman context (Battle & Looney, 2014; Wagoner, 2011). Part one of the scale covered demographic information such as years of teaching experience, gender, school location, educational degree, and specialized subject. Part two consisted of 46 items about in-service teachers' perceptions of the factors influencing their teaching professional identity. The factorial structure of the TPIS revealed three dimensions. The structure of the *teaching efficacy* dimension included 18 items for investigating teachers' perceptions of the factors influencing their lesson plans, strategies, teaching instruments, choice of content, and their students' learning and engagement. Teaching *efficacy* is a dimension of self-confidence that refers to teachers' beliefs about their ability to effectively apply teaching tasks necessary to enhance student achievement. It is a self-judgment of competence related to achieving given types of tasks and expected outcomes (Martin, 2016). The *teaching context* dimension included 12 items aimed at understanding teachers' perceptions regarding the teaching environment, the opportunities to participate in professional development programs, and the nature of the interaction between teachers and society. According to Chong et al. (2011) *teaching context* is a dimension that is specific to a school context and is affected by the surrounding environment. They argue it is affected by students, management support, and feedback loops from teachers' immediate working context and helps form teachers' developing identities. Hence, this dimension is linked to social roles within a school (Chong et al., 2011). The *teaching profession* dimension included 16 items for investigating teachers' perceptions of the social status of teaching, the degree of commitment to the teaching profession, and teachers' desire to stay in the teaching profession. The *teaching profession* is a dimension that refers to teachers` attitudes, emotions, and feelings towards teaching, pupils and their educational experiences; and the aspects of work culture that enhance teaching and learning experiences (Martin, 2016).

Forty-six items were used in the final version of the TPIS. Each item consisted of a statement with an accompanying 5-point Likert scale with options ranging from *strongly disagree* to *strongly agree*. The degree of agreement was determined according to the following range of mean score values: 4.210–5.00 for 'very high agreement' (VHA), 3.410–4.209 for 'agreement' (A), 2.610–3.409 for 'undecided or neutral' (N), 1.810–2.609 for 'low agreement' (LA), and 1.000–1.809 for 'very low agreement' (VLA).

The items on the TPIS were written in Arabic when the questionnaire was given to participants. Following this the scale was translated into English by an educational expert specializing in English and then retranslated into Arabic to ensure the overall equivalence of the translation and, in particular, to check for exact equivalence between the vocabulary of the two versions of the scale. With respect to validity and reliability, the researchers checked a number of benchmark criteria for the interpretation of the collected data. The internal consistency coefficients for the scores on the three dimensions, or subscales, of *teaching efficacy, teaching context,* and *teaching profession* were respectively 0.93, 0.94, and 0.89, as indicated by Cronbach's alpha. The internal consistency coefficient for the entire scale was 0.95. These values indicate that the TPIS has a high level of reliability. Furthermore, the correlations between the mean of the scale and the means of the dimensions were in the range of 0.72 to 0.89. The content validity of the items was established by presenting them to a group of science and mathematics supervisors who were experts in the areas of mathematics and science education to evaluate the clarity of language and suitability of each item for use with the targeted sample; they also examined the scale for comprehensiveness and relevance to the hypothesis being tested.

At the end of the questionnaire, the teachers were asked to respond to an open question about their perspectives on the factors affecting their work as mathematics or science teachers. This question allows teachers a less constricted opportunity to express their opinions regarding their experiences and factors that have affected their teacher identity during their years of experience as mathematics and science teachers.

Data Analysis

The quantitative data were analyzed using the Software Package for Statistical and Social Sciences (SPSS, 16). After gathering the participants' responses, descriptive statistics such as means and standard deviations were obtained. Additionally, the data were coded based on the following variables: gender, educational qualification, years of experience, and school location. Finally, two independent sample t-tests and a one-way test of variance were performed.

Concerning the qualitative data, in the third part of this study the participating teachers were asked to write about their perceptions of any factors influencing the teaching profession based on their experience. A proportion of 51% of the participants responded to the open-ended question. After recursively examining the data and looking for themes, it was coded. In qualitative data analysis, a code is "a construct that symbolizes and thus attributes interpreted meaning to each individual datum for later purposes of pattern detection, categorization, theory building, and other analytic processes" (Saldaña, 2013, p. 4). Data were initially coded on *teachers' professionalism, factors,* and *status*. Then, data analysis of the responses resulted in three main categories and associated sub-categories as shown in Table 2.

Table 2
Examples of Categories and Sub-Categories

Teachers' professionalism	● professional development • quality programs • opportunities for continuous development • in-service training ● aspects •practical aspects •personal aspects •behavioural aspects ● experiences • new experiences • exchange experiences
Factors	● workload • non-teaching work • school activities • administrative work ● intensity of teaching • insufficient time • number of teaching sessions
Status	● community • cooperation ● social position • teachers' roles • appreciation • motivation • rights

Research Results

Mathematics and Science Teachers’ Perceptions

Table 3 shows the teachers’ mean scores based on their responses to the items from the three subscales. The range of mean scores is from 3.86 to 4.31. The lowest mean score (3.86) is for the dimension *teaching context*, and in the middle is the dimension *teaching profession* (4.10). The dimension with the highest mean score (4.31) is *teaching efficacy*. The teachers’ responses to the questionnaire item statements revealed that within the teacher professional identity subscales of *teaching efficacy*, *teaching context*, and *teaching profession*, teachers were in very high agreement or agreement.

Table 3
Descriptive Statistics of the Subscales (Teaching Efficacy, Teaching Context, Teaching Profession)

Professional identity dimensions (subscales)	Descriptive Statistics		
	N	*M*	*SD*
Teaching efficacy	18	4.32	0.45
Teaching profession	16	4.10	0.59
Teaching context	12	3.86	0.72

Teaching Efficacy Dimension

The results in Table 4 show that within the dimension of teaching efficacy, the range of mean scores of the teachers' responses is from 4.08 to 4.53, indicating that most of the respondents indicated very high agreement.

The results also show that within the dimension of teaching efficacy, the respondents believe that a) the teaching practices they use with their students help to create a classroom environment that is characterized by mutual respect and support (*M* = 4.53, *SD* = 0.57); b) they have the ability to convince their students that math and science have practical meaning and value in life (*M* = 4.47, *SD* = 0.65); and c) they focused on fostering positive student behaviours through their methods of class management and class interaction control (*M* = 4.42, *SD* = 0.65).

Table 4
Means and Standard Deviations for the 'Teaching Efficacy' Subscale

Item no.	Item	*M*	*SD*	Degree of agreement
1	My daily and weekly plans are based on clear and measurable goals.	4.41	0.63	VHA
2	I have the ability to plan well for my lessons at an appropriate time.	4.30	0.71	VHA
3	Learning experiences given to my students reinforce problem-solving skills	4.13	0.68	A
4	I utilize teaching strategies that foster my students' use of higher thinking skills.	4.11	0.70	A
5	The scientific knowledge I provide to my students has implications and connections with real life	4.32	0.69	VHA
6	My students' responses prove their understanding of the ideas and concepts that I teach them.	4.22	0.67	VHA
7	There is a cognitive depth in the scientific content I provide to my students.	4.23	0.67	A
8	Class interaction leads to a continuous discussion between me and my students and between the students themselves.	4.41	0.66	VHA
9	I am keen to provide enough knowledge to my students about formative continuous assessments (their aims, contents, implication procedures, and their effects on students' improvement).	4.29	0.69	VHA
10	I focus on fostering positive behaviours through my ways of class management and class interaction control.	4.42	0.65	VHA
11	The teaching practices I use with my students help to create a classroom environment that is characterized with mutual respect and support.	4.53	0.57	VHA
12	I direct my students' behaviours to develop self-control and self-management among them.	4.38	0.66	VHA
13	My teaching practices focus on appreciating my students' individual differences and achieving comprehensive participation.	4.28	0.67	VHA
14	My teaching practices focus on fostering my students' positive interaction with society and encouraging active citizenship.	4.21	0.72	VHA
15	My teaching plans provide learning chances to my students that enhance their independent learning.	4.08	0.72	A
16	My teaching plans provide learning chances to my students that enhance collaborative learning.	4.24	0.71	VHA
17	I have the ability to convince my students that Math/ Science has meaning and value in practical life.	4.47	0.65	VHA
18	Taking care of all my students is a philosophy I adopt in my lesson planning and teaching.	4.40	0.66	VHA

Note. The items were arranged according to their order in the TPIS; VHA = very high agreement and A = agreement.

The results in Table 4 also reveal teachers have a very high agreement with the statement 'Taking care of all my students is a philosophy I adopt in my lesson planning and teaching' (*M* = 4.40, *SD* = 0.66). There was also very high agreement with the statement 'My daily and weekly plans are based on clear and measurable goals' (*M* = 4.41, *SD* = 0.63), and for 'I have the ability to plan well for my lessons at an appropriate time' (*M* = 4.30, *SD* = 0.71). Very high agreement was also obtained for item 5 'The scientific knowledge I provide to my students has implications and connections with real life' (*M* = 4.32, *SD* = 0.69), and item 9 'I am keen to provide enough knowledge to my students about formative continuous assessments (their aims, contents, implication procedures, and their effects on students’ improvement)' (*M* = 4.29, *SD* = 0.69).

Regarding the student engagement sub-category within the teaching efficacy subscale, the respondents were in very high agreement with the statement 'Class interaction leads to a continuous discussion between me and my students and between the students themselves' (*M* = 4.41, *SD* = 0.66). They also very highly agreed that their teaching practices focused on appreciating students’ individual differences and achieving comprehensive participation (*M* = 4.28, *SD* = 0.67).

Teaching Profession Dimension

Table 5 shows the mean scores and standard deviations for the items in the *teaching profession* dimension. The range of mean scores was from 3.30 to 4.54. The respondents were mostly in agreement with the questionnaire statements and most of the responses were in the “very high agreement” range.

Table 5
Means And Standard Deviations for the 'Teaching Profession' Subscale

Item no.	Item	*M*	*SD*	Degree of agreement
1	The educational and teaching experiences I acquired from teachers’ preparation institutions were sufficient to foster my initial steps in teaching practices.	3.94	0.90	A
2	I believe that teaching has a distinguished and preferable status in society	3.81	1.19	A
3	I chose the teaching profession because it was the only available chance to me in university education.	3.46	1.29	A
4	Being a teacher gives me feelings of achievement and continuous giving.	4.22	0.96	VHA
5	Being a teacher allows me to build social relationships with my colleagues.	4.28	0.83	VHA
6	I love teaching.	4.18	0.98	A
7	If I were given the chance to choose another profession, I would choose teaching again.	3.57	1.35	A
8	Teaching profession provides me with continuous opportunities for cognitive development.	4.05	0.99	A
9	My career as a teacher fulfils my passion for knowledge provision and building students’ personalities.	4.27	0.84	VHA
10	The teaching profession, in its nature, involves high values (sacred message, sincere giving, struggle…).	4.53	0.68	VHA
11	One of my responsibilities as a teacher is reinforcing my students’ strengths and treating their weaknesses.	4.54	0.63	VHA
12	I have future visions to improve my teaching practices and upgrade my subject learning.	4.35	0.79	VHA
13	I have the desire to acquire new knowledge and skills that improve my teaching performance.	4.41	0.76	VHA
14	I have the ability to retain my motivation to teach regardless of the difficulties I face in students’ learning.	4.21	0.82	VHA
15	One of my future goals is to foster my students’ positive attitudes toward my subject.	4.39	0.69	VHA
16	Financial allocations of the teaching profession are sufficient to provide a good standard of living for teachers.	3.30	1.25	N

Note. The items were arranged according to their order in the teaching professional identity scale; VHA = very high agreement, A = agreement, and N = undecided or neutral

The results in Table 5 show that within the *teaching profession* dimension, there was a very high agreement with the statement 'One of my responsibilities as a teacher is reinforcing my students’ strengths and treating their weaknesses' (*M* = 4.54, *SD* = 0.63). They also had very high agreement with item 11 which stated that 'the teaching profession, by its nature, involves high values–sacred messages, sincere giving, struggle, and so on' (*M* = 4.53, *SD* = 0.68). The results also indicated that the respondents have a desire to acquire new knowledge and skills that improve their teaching performance (item 13) (*M* = 4.41, *SD* = 0.76) and have future visions to improve their teaching practices and upgrade student learning in the subject (item 12) (*M* = 4.35, *SD* = 0.79).

The respondents also pointed to the role of the teaching profession in allowing them to build social relationships with their colleagues (Item 5) (*M* = 4.28, *SD* = 0.83) and providing them with continuous opportunities for cognitive development (Item 8) (*M* = 4.05, *SD* = 0.99). The environment in schools should be such that there is an exchange of knowledge and experiences between teachers resulting in new classroom practice and developmental perspectives. Professional identities - based on personal values, previous beliefs, and experiences - are considered to be continuously evolving and develop through ongoing experiences and contexts. The respondents 'very highly agreed' with the statement that 'being a teacher gives them feelings of achievement and continuous giving' (Item 4) (*M* = 4.22, *SD* = 0.96). So, it would seem that teachers' professional identities are strengthened and developed in work environments where colleagues interact together and dynamic professional development programs are available in schools.

The respondents were undecided or neutral about the item 16 'financial allocations of the teaching profession are sufficient to provide a good standard of living for teachers' for which their mean score (*M* = 3.30, *SD* = 1.25) was much lower compared with all other items over the three dimensions. Hence it would seem that the improvement or decline in salaries and working conditions over the years has had a proportionate impact on teacher status.

Teaching Context Dimension

Table 6 shows the mean score and standard deviations for the teachers' perceptions of the factors influencing their teacher professional identity in the dimension of *teaching context*. The results show that within the teaching context sub-scale, the range of mean scores was from 3.54 to 4.06. All of the responses were in the 'agreement' range.

Table 6

Means and Standard Deviations for the of 'Teaching Context' Subscale

Item no.	Item	*M*	*SD*	Degree of agreement
1	The school working environment is stimulating, supportive and safe.	3.81	0.95	A
2	The school provides opportunities for collaboration and exchanging experiences between colleagues.	4.05	0.85	A
3	The work environment gives me the chance to express my professional development needs.	3.75	0.98	A
4	My school gives me continuous and various chances for professional development.	3.77	0.96	A
5	My school gives me sufficient time to meet my professional development needs.	3.54	1.01	A
6	I received professional development programs that helped me to improve my teaching practices and gain good knowledge.	3.77	1.01	A
7	My school trusts me in presenting my teaching knowledge and experiences and sharing them with my colleagues.	4.03	0.91	A
8	The professional development programs that I received had good content quality and directly connected with the teaching profession’s requirements.	3.79	1.01	A
9	I communicate well with my students’ parents in regard to their children’s learning and dealing with their problems.	3.95	0.90	A
10	I make good efforts to communicate with the school social worker and the administration to help my students with their personal and family problems and their learning difficulties.	3.94	0.94	A
11	My school evaluates my teaching quality based on my students’ grades in the evaluation tools.	3.71	0.93	A
12	My school evaluates my teaching quality based on the types and quality of learning experiences I provide to my students.	4.06	0.80	A

Note. The items were arranged according to their order in the teaching professional identity scale; A = agreement.

The results in Table 6 show that the respondents, within the dimension of *teaching context*, thought that their schools evaluated their teaching quality based on the types and quality of learning experiences teachers provided to their students (Item 12) (*M* = 4.06, *SD* = 0.80). The results also showed that teachers' believe schools have a role in providing teachers with opportunities for collaborating and exchanging experiences between colleagues (Item 2) (*M* = 4.05, *SD* = 0.85), that schools trust teachers in presenting their teaching knowledge and experiences and sharing them with their colleagues (Item 7) (*M* = 4.03, *SD* = 0.91), and that the school working environment is stimulating, supportive, and safe (Item 1) (*M* = 3.81, *SD* = 0.95).

The respondents also agreed with the statements that their school has a role in offering them continuous and various chances for professional development (Item 4) (*M* = 3.77, *SD* = 0.96), and sufficient time to meet their professional development needs (Item 5) (*M* = 3.54, *SD* = 1.01). It is not surprising then that teachers agreed with item 6 'I received professional development programs that helped me to improve my teaching practices and gain good knowledge' (*M* =

3.77, *SD* = 1.01). They also agreed with item 8 that the professional development programs that they received had good content quality and directly connected with the requirements of the teaching profession (*M* = 3.79, *SD* = 1.01). It would seem that professional development opportunities are one of the more direct influences on the development of teacher professional identity. Moreover, teacher education and professional development initiatives with a focus on content knowledge and teaching methods must play a large role in teaching efficiency and learning quality.

Regarding teachers' communication with stakeholders, the respondents agreed with the item 9 statement 'I communicate well with their students' parents and society's institutions in regard to their children's learning and dealing with their problems' (*M* = 3.95, *SD* = 0.90). They also indicated that they made good efforts to communicate with the school social workers and the administration to help their students with their personal and family problems and their learning difficulties (Item 10) (*M* = 3.94, *SD* = 0.94).

Factors Influencing Teachers' Professional Identity

In this study, it was assumed that factors such as years of experience, gender, grade level taught, educational degree, and specialized subject would influence teachers' perceptions of their professional identity. It is hypothesized that there are significant differences (at $\alpha \leq 0.05$) in teachers' perceptions according to these variables. The results of a Shapiro-Wilk's test ($p > .05$) showed that data collected for the afore mentioned variables were approximately normally distributed. Using a one-way analysis of variance (see Table 7 and Table 8), we attempted to find differences in teachers' perceptions of their teacher professional identity in terms of the total identity scores on the questionnaire. The results showed that there were statistically significant differences at the.05 level in teachers' perceptions for the *years of teaching experience, gender,* and *school location* variables. However, it appeared that the mean scores did not differ significantly at the 0.05 level for the *educational degree* or the *specialized subject* variables. Through multiple comparisons, the results showed that for *school location*, the mean scores of "AlBat" and "Alsh" were significant. The results also showed that for *years of teaching experience*, the mean scores between "1-4" and "> 8" and the mean scores between ""1-4" and "5-8" were significantly different (Table 9).

Table 7
Means and Standard Deviations for the Demographic Variables

Factors		***N***	***MS***	***SD***
Years of teaching experience	1-4	55	3.91	.51
	5-8	114	4.11	.48
	> 8	226	4.12	.49
	Total	395	4.09	.49
Gender	Male	131	3.94	.48
	Female	264	4.16	.49
	Total	395	4.09	.49
School location	AlBat	164	4.14	.49
	Alda	134	4.10	.46
	Alsh	97	3.98	.55
	Total	395	4.09	.49
Educational degree	Bachelor	348	4.09	.50
	Diploma	27	4.16	.39
	Educational Diploma	20	4.03	.59
	Total	395	4.09	.49
Specialized subject	Science	194	4.04	.49
	Mathematics	201	4.13	.50
	Total	395	4.09	.49

Table 8
One-Way Analysis of Variance for the Demographic Variables

Factors		*SS*	*df*	*MS*	*F*	*p*	*EZ*
Years of teaching experience	Between Groups	2.01	2	1.01	4.12	.017	.021
	Within Groups	95.63	392	.244			
	Total	97.64	394				
Gender	Between Groups	4.17	1	4.17	17.54	.001	.043
	Within Groups	93.47	393	0.24			
	Total	97.64	394				
School location	Between Groups	1.655	2	0.83	3.38	.035	.017
	Within Groups	95.99	392	0.25			
	Total	97.64	394				
Educational degree	Between Groups	.219	2	.109	.44	.645	.002
	Within Groups	97.42	392	.25			
	Total	97.64	394				
Specialized subject	Between Groups	.79	1	.79	3.14	.075	.008
	Within Groups	96.85	393	.25			
	Total	97.64	394				

Table 9
Multiple Comparison (Post- Hoc) Of the 'School Location', and 'Years of Teaching Experience' Variables

Factors	School Location	School Location	*M.D*	*S.E*	*p*
School Location	AlBat	Alda	.04	.06	.78
	Alsh	.16	.06	.04	
		AlBat	-.04	.06	.78
	Alda Alsh	.12	.07	.18	
	Alsh	AlBat	-.16	.06	.04
	Alda	-.12	.07	.18	
Years of teaching experience	1-4	5-8	-.19	.09	.06
		> 8	-.21	.07	.02
	5-8	1-4	.19	.08	.06
		> 8	-.01	.06	.97
	> 8	1-4	.21	.07	.02
		5-8	.01	.06	.97

It has been shown that acquiring a professional identity as a teacher is not a one-size-fits-all endeavour as teachers do not always need or desire to reach the same degree. The acquisition of professional identity as a teacher is not related to age but rather is linked to a set of interrelated and complementary factors. The professional identity of teachers is about their sense of self and it mediated through a) the roles they play inside and outside school, b) the acquisition of knowledge, skills, and educational competencies, and c) their level of commitment to the values and ethics of their profession.

Teachers' skills and competencies develop during their classroom practice and through attending professional development programs. As a result of the many social, economic and other factors impacting the teaching profession, as well as the ongoing evolution in educational approaches, researchers have found that inexperienced teachers may need time and specific opportunities to perform their professional roles effectively. As a result, there may be differences in how teachers view their professional identity depending on their years of experience teaching and the conditions, culture and access to training at their institution.

Results of the Open Question

The qualitative data analysis of the responses to the open question resulted in the following main themes: lack of quality professional development programs, workload and time pressure, and unsatisfactory status of the teaching profession in society.

Lack of quality professional development programs

Professional identity affects the development of teachers' self-efficacy and professional development; and also impacts teachers' ability to deal with educational challenges, and embed creativity in their teaching practices. In this study, 41 mathematics and science teachers wrote that the professional development programs they received in schools lacked certain practical aspects. They highlighted a need for programs that feature new approaches in the field of teaching as well as applications of new technical and interactive teaching tools to enhance teaching practices. Responses included the following: "*The teacher must obtain opportunities for training and continuous development and provide him with scientific programs which are related to the content of the curriculum and be in keeping with the new technology*" (October 10, 2018, science teacher with 3 years of experience); "*I hope that the MoE offers training opportunities and courses for teachers and sent [them] to other countries to benefit from the experiences of other teachers" (*October 28, 2018*,* science and mathematics teacher for grades 1 to 4 with 2 years of experience); "*holding workshops within the school between teachers of one subject to exchange experiences and teaching methods* (October 7, 2018, science and mathematics teacher for grades 1 to 4 with 3 years of experience); "*providing quality training opportunities for teachers with an applied nature through which new ideas are presented regarding how to deal with individual differences between students*" (October 7, 2018, science teacher with 2 years of experience).

Taking the respondent's comments into consideration, teacher preparation programs need to be developed in a way that enables them to offer high-quality professional preparation courses that are easily accessible for all instructors. The programs should focus on enhancing the professional values and attitudes teachers possess, not just their scientific and pedagogical training. The responses also highlighted the need to pay attention to the psychological and career guidance services on offer in various teacher education institutions to help student teachers to maximally develop their professional identity and overcome the problems involved with of choosing a profession and transitioning into work life. In addition, teacher education institutions should extend the necessary support to teachers to overcome the difficulties they face in work.

Workload and time pressure

Fifty respondents elaborated on the non-teaching workload required in schools as a negative aspect of their job. They also pointed to 'time constraints' as a challenge they faced in their teaching experiences. They stated that the packed curriculum and the insufficient time to achieve all identified learning goals as the main reasons for feeling time pressure in their job. Some examples regarding this issue from respondents are as follows: "*Teaching should be separated from school activities and administrative work*" (October 4, 2018, science teacher with 3 years of experience); "*The number of teaching periods is large, which is a source of pressure and a barrier between the teacher and creativity* (October 4, 2018, science teacher with 3 years of experience); "*The administrative work overload must be eased so that the teacher can give the teaching profession his attention*" (October 7, 2018, science and mathematics teacher for grades 1 to 4 with 3 years of experience); "*In fact, the high number of periods of teaching, the multiplicity of curricula we teach, and the variety of evaluation methods we apply are the most difficult challenges facing us*" (October 7, 2018, science teacher with 3 years of experience); "*School activities and paperwork have become a burden on the teacher that hinders his efforts in planning for the curriculum and thus reduces his efforts for students' learning*" (October 14, 2018, science teacher with 12 years of experience).

The participating teachers suggested reducing the number of teaching sessions for each teacher to give him opportunities for self-directed professional development in order to improve learning outcomes for students. For example, one of the participants stated,

> "*We need a lot of work to raise the efficiency of teachers, shorten the curricula, and pay attention to the quality rather than the quantity, and finally we need to provide a supportive and attractive learning environment for the students and the teachers*" (October 14, 2018, mathematics teacher with 3 years of experience).

Another one said, *"The teacher should focus on the requirements of the teaching profession only without other burdens on him, such as doing administrative work and organizing school activities*" (October 14, 2018, science teacher with 12 years of experience). Another participant suggested that teachers' performances could be developed by "*reducing the teacher's quorum of classes and accompanying work and reducing the number of pupils in the classroom helps the teacher to develop his teaching performance*" (October 20, 2018, mathematics teacher with 3 years of experience).

Status of the teaching profession in society

Fifty-nine respondents highlighted the importance of enhancing the position of teachers in society by respecting their rights and supporting them to accomplish their teaching tasks. The teachers also pointed to the importance of cooperation between the members of the community, the MoE, schools, and the parents of students to aid the teachers' in their roles. Comments related to status in society included the following: "*strengthening the position of the teacher socially is the first step in building a school that is capable of providing qualified outputs*" (October 14, 2018, science teacher with 2 years of experience); "*The teacher should be appreciated, respected by all, motivated by professional advancement, honored and given all his rights*" (October 21, 2018, science teacher with 3 years of experience); "*We need to appreciate the efforts of the teachers in the field, from school principals and the MoE, especially for experienced teachers*" (October 9, 2018, science teacher with 3 years of experience).

Fifty respondents made suggestions of possible ways to enhance the status of the teaching profession and help teachers improve learning outcomes for students. Based on the responses, practical recommendations that can be grouped into three main categories have been formulated:

- Offer a stimulating and supportive school environment for teachers and students by providing educational tools with modern technological facilities and reduce the number of students in classes.
- Strengthen teachers' professionalism by opening channels of cooperation between them and community members and institutions, and through promotions and rewards.
- Provide effective professional development programs for teacher educators that are designed to ensure cohesive, comprehensive and integrated training support.

Discussion

The results showed that the respondents credited the role of the teaching profession in allowing them to build social relationships with their colleagues and providing them with continuous opportunities for cognitive development. The environment in schools should be such that there is an exchange of knowledge and experiences between teachers that results in new classroom practice and developmental perspectives. Professional identities - based on personal values, previous beliefs, and experiences - are considered to be continuously evolving and develop contextually through ongoing experiences. The respondents showed 'very high' agreement with the statement 'being a teacher gives them feelings of achievement and continuous giving'. Therefore, it would seem that teachers' professional identities are strengthened and developed in work environments where colleagues interact together, and dynamic professional development programs are available in schools.

The results also showed that due to the many ongoing social, economic and policy changes impacting the teaching profession, not to mention the ongoing evolution in educational approaches, inexperienced teachers need substantial time and specific support to perform their professional roles effectively. As a result, there may be differences in how teachers view their professional identity depending on their years of experience teaching and the conditions, culture, and access to training at their institution.

Teacher professional identity has an impact on teachers' practices in multiple ways as it promotes self-regulation, self-motivation, and adaptation in the learning environment. The professional identity of teachers shapes their sense of themselves and is impacted by the roles they play inside and outside the school; the knowledge and skills they acquire; and their commitment to the values and ethics of their profession. In order for teachers to maintain their professional standing and remain in the profession, their personal growth alongside their professional growth must be supported, and they should be encouraged, through financial and social support, to take on executive roles.

Teachers' personal and professional experiences throughout their in-service education play a crucial role in shaping their professional identities and have a significant effect on what kind of teachers they are to become. Hsieh (2016) argued that teachers' personal experiences, approaches to reflection on teaching performance, and periodic evaluations of the quality of their teaching practices are the factors which most affect the development of their teacher professional identity. In turn, Hseih argues that this identity has a profound influence on how teachers' teach curricular content**.** Teachers' professional identity, with its philosophy and foundations, represents a reference point upon which teachers' roles and responsibilities are based.

Offering teacher education programs that help teachers maintain positive perceptions, attitudes, and actions, as well as encourage them to be independent and take responsibility to solve problems and face challenges can greatly improve their professional identity. Guskey (2002) pointed out that teachers need ample opportunities for developing their pedagogical practices and knowledge and reflecting on their teaching performance. Clarke and Hollingsworth (2002) claimed that improving teacher identity requires self-reflection on knowledge, perceptions, beliefs, and attitudes in order to harness them to improving student learning outcomes. In order to improve teachers' professional identity, all education stakeholders should (a) provide high-quality teacher education, teacher professional development programs, and supportive career environments; (b) improve salaries and working conditions; and (c) ensure teachers' involvement in decision-making and promote their positive representations and status in society (Symeonidis, 2015).

The quality of education outcomes is closely related to enhancing teachers' positions in their work environments and in society. There is an important relationship between the concept of professional identity and the development of socio-educational knowledge and methodology. Teachers' identity is shaped by the social and cultural contexts that affect their beliefs, perceptions, and teaching practices. Teachers' identity also affects society indirectly through their performance in the classroom and their relationships with students in teaching and learning situations. Hsieh (2016) described several factors affecting the formation and development of teacher professional identity, including personal factors (e.g., experiences as students, experiences as new teachers, and self-perceptions of the work environment), factors associated with teacher education programs (e.g., teacher education programs in universities), working environment conditions or political contextual factors (e.g., isolation versus cooperation), as well as factors related to performance evaluation, evaluation methods and accountability that allow measurable quality teaching.

Conclusions and Implications

To sum up, the results showed that within the dimensions of *teaching efficacy*, *teaching context*, and *teaching profession*, teachers' had positive perceptions of their teacher professional identity (very high agreement or agreement). The results showed that there were significant differences in teachers' perceptions of their teaching profession for the factors *years of teaching experience, gender,* and *school location*. However, it appeared that there were no significant differences in teachers' perceptions of their teaching profession for the factors *educational degree* and *specialized subject*. Moreover, qualitative data analysis of the open-ended question confirmed that mathematics and science teachers thought there were main three main categories of factors influencing their professional identity: lack of quality professional development programs, workload and time pressure, and the unsatisfactory status of the teaching profession in society.

Our research has revealed several internal factors impacting teachers' identities such as personal experiences, beliefs, values, and teaching aptitude. Additionally, this study has explored environments, including work environments and the wider community, which impose conditions under which teachers develop a strong sense of what it means to be a teacher. Although the study highlighted some very useful points about math and science teachers' professional identities, it also had some limitations. We focused specifically on investigating the factors that influence teacher professional identity, bearing in mind that other theoretical approaches may also be suitable for revealing the perceptions of science and mathematics teachers. Also, conducting the study in only 3 out of 11 educational governorates, and using a self-report questionnaire and one open-ended question could limit the generalizability of our conclusions. Therefore, we suggest using multiple approaches to get a more accurate and detailed perception of teacher identity and the factors affecting it. Since teacher professional identity is a continual process that is influenced by complex social, individual, and contextual factors, future research will need to achieve the following:

- explore the interrelationships between the main factors that influence teacher professional identity.
- explore teacher professional identity with a larger sample of teachers.
- link teacher professional identity with actual classroom practices via observation.
- compare the professional identities of pre-service and in-service teachers.

Acknowledgments

The authors would like to acknowledge the Ministry of Education/Sultanate of Oman for allowing them to conduct the research in its schools. The paper was funded by Sultan Qaboos University under grant no. (IG/EDU/CUTM/18/01).

Declaration of Interest

The authors declare no competing interest.

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Received: *January 28, 2023* Revised: *April 18, 2023* Accepted: *June 02, 2023*

Cite as: Ambusaidi, A. K., & Alhosni, K. Z. (2023). Mathematics and science teachers' perceptions of the factors influencing teaching and professional identity. *Problems of Education in the 21st Century*, *81*(3), 303-326. https://doi.org/10.33225/pec/23.81.303

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CONSTRUCTION AND VALIDATION OF MATHEMATICAL SATISFACTION QUESTIONNAIRE: AN EXPLORATORY AND CONFIRMATORY FACTOR ANALYSIS

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Abstract

Mathematics satisfaction can drive students to work harder in math class. Thus, it is vital to assess the satisfaction of learners using an instrument to intervene in the teaching and learning process. There are research studies that have independently developed questionnaires to measure students' mathematics satisfaction, but most of them focused on students' satisfaction with mathematical resources and online mathematics courses. Thus, previously developed instruments had limitations. The purpose of this study was to develop and validate a mathematical satisfaction questionnaire for students. Face validation, content validation, exploratory factor analysis, confirmatory factor analysis, and reliability testing were used in the study to construct and validate the instrument. The initial draft of the mathematical satisfaction questionnaire has 44 items divided into five categories: skill, real-life, academic, praise, and task completion. The study's sample included 317 students from the Nueva Ecija University of Science and Technology – Gabaldon campus. The content validity of the test was assessed by ten instructors and professors using Aiken's V technique. The construct validity was examined using exploratory and confirmatory factor analysis. Aiken's V coefficient ranged from 0.73-0.87, which is adequate for the content validity index. Every construct has an acceptable reliability coefficient. Eight items were removed following EFA. Construct validation confirmed 36 items distributed among the five mathematical satisfaction constructs. The final instrument is reliable and can be used to assess students' mathematical satisfaction.

Keywords: *Item measurement, mathematical satisfaction, reliability test, validity test*

Introduction

Mathematical satisfaction is concerned with students' intrinsic and extrinsic satisfaction with mathematics, and it encompasses praise from others, skill satisfaction, task accomplishment, academic satisfaction, and real-life situations. Mathematical satisfaction may inspire students to study and strive for excellence in mathematics. It's frequently thought of satisfaction in mathematics as a desirable, good emotion during the learning process (Barnes, 2021). As a result, it is essential to assess the student's mathematical satisfaction to provide appropriate assistance in mathematics teaching. Identifying the characteristics that lead to student satisfaction in mathematics learning, on the other hand, is critical for educators. As a result, the current research work attempted to design a mathematical satisfaction instrument construct.

The purpose of a questionnaire is to collect information from the respondents about their attitudes, experiences, and opinions (Bhandari, 2021). The questionnaire must go through several testing methods to produce an accurate result based on the collected data. In general, a good questionnaire should be valid, reliable, clear, concise, and interesting (Jenn, 2006). According to Tsang et al. (2017), a validated questionnaire is a scale or questionnaire that has been designed to be used with the intended respondents and has undergone validation using a

https://doi.org/10.33225/pec/23.81.327

representative sample, proving sufficient reliability and validity. The questionnaire is validated by experts or panellists who have a thorough understanding of the subject matter. Similarly, the consistency or stability of scores over time or across raters is a characteristic of a reliable questionnaire, which yields the same findings on repeated attempts (Bolarinwa, 2015). There are four methods for establishing questionnaire reliability: inter-rater, test-retest, parallel forms, and internal consistency reliability tests (Sauro, 2015).

Currently, it is difficult to find a questionnaire that measures the mathematical satisfaction of the students in terms of a different construct such as praise from others, skill satisfaction, task accomplishment, academic satisfaction, and real-life situations. The research study conducted by González-Ramírez and García-Hernández (2021) was only developed to assess satisfaction with mathematics study materials, while Modu (1970) designed a questionnaire to measure students' persistence in college and satisfaction with their major fields such as mathematics and English. In addition, Ramos et al. (2022) and Davis (2014) focused on students' satisfaction with online mathematics course. Furthermore, Lee (2014) used a questionnaire to assess the satisfaction levels of graduate students of mathematics, but the questionnaire focused on human constructs such as professors, instructional associates (IA) or graduate assistants (GA), course structure and technical aspects, while Majeed et al. (2001) used mathematics satisfaction questionnaire that focused on the extent of enjoyment of class work. On the other hand, several studies focused on the different satisfaction scales, such as Wang et al. (2007) and Hwang and Kim (2022) who developed and validated an e-learning satisfaction scale, Rahmatpour et al. (2021) constructed and validated a postgraduate nursing student academic satisfaction scale, Franklin et al. (2014) focused on students' satisfaction and confidence on learning, and Courtney-Pratt et al. (2015) focused on the development of satisfaction with cultural simulation experience scale.

The researcher conducted this study based on similar studies to develop a questionnaire that may measure students' mathematics satisfaction such as praise satisfaction from others, skill satisfaction, task accomplishment, academic satisfaction, and real-life scenarios. To address a broader variety of mathematics problems related to education and to undertake essential interventions, mathematics education must need an instrument that comprehensively measures students' satisfaction. Educators and researchers can utilize the instrument developed to fill a gap in gauging mathematics satisfaction. Furthermore, researchers can utilize this questionnaire to learn about the various aspects of student satisfaction with mathematics learning.

The current research aimed to (a) design and develop a validated instrument to be used for measuring students' mathematical satisfaction; (b) test the reliability of each construct of mathematical satisfaction; and (c) test the validity of each construct of mathematical satisfaction.

Research Methodology

Research Design

This study was carried out to create a questionnaire that can assess students' mathematical satisfaction in five different dimensions. The following processes were used to develop the questionnaire: (a) conducting interviews with experts and face validity; (b) content validation; (c) exploratory factor analysis; (d) confirmatory factor analysis; and (e) reliability testing. The study aimed to develop and validate a mathematical satisfaction questionnaire. The respondents of the research study are the students of Nueva Ecija University of Science and Technology – Gabaldon campus. The research study was conducted from September 2022 to March 2023.

Interviews with Experts and Face Validity

In this step, the researcher interviewed three mathematics teachers from the Department of Education, four instructors, and five mathematics professors from Nueva Ecija University of Science and Technology about relevant items on the various constructs of mathematical satisfaction. The researcher seeks the expertise of educators from different sectors of education in the Philippines to establish a more thorough and broad understanding of mathematical satisfaction. The interviews were recorded by the researcher so that expert insight could be kept. After evaluating and analyzing the interview, the researcher generated 44 items using face validation. Researchers' subjective assessments of a measuring instrument's presentation and applicability, including whether the items seem relevant, reasonable, simple, and clear, are referred to as face validity (Oluwatayo, 2012). The 44 items were classified into five constructs: seven for praise satisfaction from others, thirteen for skill satisfaction, seven for task accomplishment, eight for academic satisfaction, and nine for a real-life situation.

Content Validation

The level to which an instrument's elements accurately reflect its content domain is known as content validity (Zamanzadeh et al., 2015). The content validity of the questionnaire is determined by the researcher using Aiken's V technique, which was developed by Aiken (1980). Ten instructors and professors from the College of Education are enlisted by the researcher to rate each item in the questionnaire's five primary dimensions. Each item receives a score from the rater based on how relevant it is to the particular construct. For each item, the lowest and maximum scores are 1 and 4, respectively. The formula of Aiken's V is $V = \sum \{(r - lo) / [n (c - 1)]\}$, where r is the score that might be given by the faculty rater to an item, lo is the lowest possible score that might be given for each item, c is the maximum possible score that might be given for each item, and n is the number of raters. The critical value for 10 raters is 0.73.

Sample

The study utilized a sample size of 317 students from Nueva Ecija University of Science and Technology Gabaldon Campus. The respondents consist of 221 females (69.7%) and 96 males (30.3%). The sample size is based on the rule of 300. According to Garson (2008), there should be at least 300 sample-size cases in running factorial analysis (EFA and CFA). Furthermore, Bryant and Yarnold (1995) argued that one's sample should be at least five times the number of variables. The number of items analyzed in this study is 44, hence there should be at least 220 responses. As a result, 317 samples were sufficient for EFA and CFA. The Google forms are accompanied by a letter of consent for the respondent, which was signed by the campus director. It is not compulsory to respond to the Google forms. The researchers also secure the participants' identities, and the data supplied were kept confidential to protect and consider the respondents' privacy.

Data Collection

Google forms were used to obtain the data. It was distributed to 600 students at the Nueva Ecija University of Science and Technology - Gabaldon campus between January 2, 2023, and February 2, 2023. The researcher sends Google forms to all sections and courses at NEUST - Gabaldon. The researcher reminds each year and section about the survey with the assistance of class advisers. After a month, and after all sections and courses had been responded to, the Google form was closed. The survey got 317 responses.

Data Analysis

The exploratory factor analysis was performed first in the analysis of the data. The author used the Kaiser-Meyer-Olkin (KMO) to assess the appropriateness of using factor analysis on the data set. The KMO values between 0.8 to 1.0 indicate the sampling is adequate (Shrestha, 2021). To test the null hypothesis that the correlation matrix is an identity matrix, Bartlett's test of Sphericity was performed. Bartlett's Test of Sphericity must be less than 0.05 for Factor Analysis to be suitable (Van Truong et al., 2016). In addition, the author used the varimax rotation method. At one level of factor analysis, the varimax rotation approach was utilized to clarify the relationship between the factors (Dilbeck, 2017). In this study, the requirements are an Eigenvalue > 1 and a minimum loading factor of 0.5. Confirmation factor analysis (CFA) was used to determine the scales' model fit, convergent validity, and discriminant validity. The scales model fit must have a comparative fit index (CFI) value of 0.90 or greater (Hu & Bentler, 1999), a Tucker-Lewis index (TLI) value of 0.95 (Hu & Bentler, 1998), a goodness of fit index (GFI) value of greater than 0.95 (Miles and Shevlin, 1998), and an acceptable root mean square of approximation (RMSEA) value between 0.05 and 0.08. (Fabrigar et al., 1999). Cronbach's alpha was used for internal consistency reliability testing of the scale and each factor. According to various studies, an alpha value of 0.7 is sufficient to measure an instrument's internal consistency (Taber, 2018). The Cronbach’s alpha coefficient of $\alpha<0.5$ is unacceptable, $0.6> \alpha\geq0.5$ is poor, $0.7> \alpha\geq0.6$ is questionable, $0.8> \alpha\geq0.7$ is acceptable, $0.9> \alpha\geq0.8$ is good, and $\alpha\geq0.9$ is excellent (Glen, 2022).

Research Results

Content Validation

The content validity of each item is shown in Table 1. Each item's content validity value was equal to or greater than the critical value of 0.73, indicating that all items were acceptable and were all considered for factorial analysis.

Table 1.
Content Validity of each Item

	Praise satisfaction	**Aiken’s V**	**Interpretation**
PS1	I was pleased when someone complimented my ability in maths.	.77	Valid
PS2	I am delighted with my teacher's compliments on my math performance.	.73	Valid
PS3	I am delighted with my parents' compliments on my mathematics ability.	.73	Valid
PS4	I'm happy to be acknowledged for my accomplishments in mathematics by others.	.83	Valid
PS5	I appreciate being addressed as Mr. or Mrs. Mathematician.	.83	Valid
PS6	The compliments my superiors have made regarding my mathematics abilities fill me with pride.	.87	Valid
PS7	The mathematics awards I received bring me joy.	.80	Valid
	Skill satisfaction		
SS1	I am fulfilled to derived equations algebraically.	.87	Valid
SS2	I am satisfied with my problem-solving skill.	.87	Valid
SS3	I am satisfied when I know what to do with a specific mathematical problem.	.73	Valid
SS4	I am fulfilled that I can use specific measuring tools to measure something.	.80	Valid

SS5	I am fulfilled about my algebraic skills.	.80	Valid
SS6	I am fulfilled about my logical skills.	.87	Valid
SS7	I am fulfilled about my inductive reasoning skills	.87	Valid
SS8	I am fulfilled about my deductive reasoning skills.	.83	Valid
SS9	I am fulfilled about my derivation skills	.77	Valid
SS10	I am fulfilled about my integration skills	.77	Valid
SS11	I am fulfilled about my statistical skills.	.77	Valid
SS12	I am fulfilled about my critical thinking skill.	.80	Valid
SS13	I am fulfilled with my analytical thinking skill.	.80	Valid
	Task accomplishment		
TA1	I am pleased when I accomplished my activities, assignment, projects in mathematics.	.80	Valid
TA2	I loved to accomplish my activities, assignments, projects in mathematics before the deadline.	.80	Valid
TA3	I am fulfilled that I solve mathematics problems on time.	.77	Valid
TA4	I am fulfilled that I solved mathematics problems accurately.	.80	Valid
TA5	I am fulfilled with my mathematics output.	.73	Valid
TA6	I am fulfilled that I can accomplish mathematics tasks on time	.80	Valid
TA7	I am fulfilled that I can accomplish mathematics tasks with no constraints.	.73	Valid
	Academic satisfaction		Valid
AS1	Getting a high grade in mathematics was fulfilling.	.83	Valid
AS2	I loved to be top performing in mathematics class.	.73	Valid
AS3	I am so much fulfilled with the mathematics grade of 1.25 (90 and above).	.73	Valid
AS4	I am satisfied with my mathematics performance.	.83	Valid
AS5	I am satisfied with the results of my mathematics examination.	.80	Valid
AS6	I am satisfied with the results of my mathematics quizzes.	.80	Valid
AS7	I am satisfied with the results of my mathematics assignments and activities.	.80	Valid
AS8	I am satisfied with the results of my mathematics project.	.83	Valid
	Real-life situation		
RL1	I loved applying mathematics principles in real-life situations.	.83	Valid
RL2	Applying mathematics principles in selling or buying something was fulfilling.	.83	Valid
RL3	I am satisfied when I solved real-life problems using mathematics.	.87	Valid
RL4	Applying mathematics principles in work was fulfilling.	.87	Valid
RL5	Applying mathematics principles in my social life was fulfilling.	.80	Valid
RL6	Applying mathematics principles to my family was fulfilling.	.83	Valid
RL7	Applying mathematics principles in my spiritual life was fulfilling.	.83	Valid
RL8	Applying mathematics principles to my finances was fulfilling.	.77	Valid
RL9	Applying mathematics principles in planning something was fulfilling.	.77	Valid

Exploratory Factor Analysis (EFA)

According to Table 2, the value of the Kaiser-Meyer-Olkin Measure of Sampling Adequacy is 0.963, which is excellent. In addition, the Bartlett's test of sphericity is significant. Both EFA assumptions are met, hence the factorial analysis is appropriate for the data.

Items TA5, TA7, AS1, AS2, AS3, SS3, PS2, and PS3 were deleted after applying EFA using Varimax rotation because their loading factor value was less than 0.5. Following the deletion of items that did not meet the loading factor of 0.5, the statistical analysis was re-run (Samuels, 2017). EFA confirmed the five factors for mathematical satisfaction and these are; skill satisfaction (12 items), real-life satisfaction (9 items), academic satisfaction (5 items), praise satisfaction (5 items), and task accomplishment (5 items).

Table 2
Kaiser-Meyer-Olkin and Bartlett's Test of Sphericity

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.963
Bartlett's Test of Sphericity	Approx. Chi-Square	10488.231
	df	630
	p	*p* < .001

Reliability of Each Factor

Table 3 shows the reliability coefficient for each factor. Cronbach's alpha was used to determine the internal consistency of the items. Each factor falls into the good and excellent categories. Furthermore, Griethuijsen et al. (2014) stated that a level greater than or equal to 0.70 was considered adequate or satisfactory. Thus, Cronbach's alpha for each factor is reliable for factor-based scales.

Table 3
Reliability Coefficients.

Factors	Cronbach's Alpha	Interpretation
Skills Satisfaction	.88	Good
Real Life	.95	Excellent
Academic Satisfaction	.95	Excellent
Praise Satisfaction	.88	Good
Task Accomplishment	.89	Good

Loading Factors

The factor loading of each factor is shown in Table 4. Each item has a loading factor greater than the reference value of 0.5. As a result, each item fits the criteria in factor analysis, confirming the five factors for mathematical satisfaction. Every item loads with the proper loading factor, demonstrating the significant construct validity of every item.

Table 4
Loading Factor in EFA

Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
SS8. I am fulfilled about my deductive reasoning skills.	.826				
SS9. I am fulfilled about my derivation skills	.824				
SS7. I am fulfilled about my inductive reasoning skills	.798				
SS10. I am fulfilled about my integration skills	.788				
SS11. I am fulfilled about my statistical skills.	.747				
SS6. I am fulfilled about my logical skills.	.738				
SS13. I am fulfilled with my analytical thinking skill.	.737				
SS12. I am fulfilled about my critical thinking skill.	.718				
SS5. I am fulfilled about my algebraic skills.	.708				
SS1. I am fulfilled to derived equations algebraically.	.662				
SS2. I am satisfied with my problem-solving skill.	.605				
SS4. I am fulfilled that I can use specific measuring tools to measure something.	.550				
RL5. Applying mathematics principles in my social life was fulfilling.		.798			
RL6. Applying mathematics principles to my family was fulfilling.		.780			
RL7. Applying mathematics principles in my spiritual life was fulfilling.		.773			
RL4. Applying mathematics principles in work was fulfilling.		.745			
RL3. I am satisfied when I solved real-life problems using mathematics.		.729			
RL2. Applying mathematics principles in selling or buying something was fulfilling.		.682			
RL1. I loved applying mathematics principles in real-life situations.		.681			
RL8. Applying mathematics principles to my finances was fulfilling.		.625			
RL9. Applying mathematics principles in planning something was fulfilling.		.605			
AS7. I am satisfied with the results of my mathematics assignments and activities.			.773		
AS5. I am satisfied with the results of my mathematics examination.			.769		
AS6. I am satisfied with the results of my mathematics quizzes.			.766		
AS8. I am satisfied with the results of my mathematics project.			.763		
AS4. I am satisfied with my mathematics performance.			.728		
PS5. I appreciate being addressed as Mr. or Mrs. Mathematician.				.763	
PS6. The compliments my superiors have made regarding my mathematics abilities fill me with pride.				.761	

PS4. I'm happy to be acknowledged for my accomplishments in mathematics by others.	.666	
PS1. I was pleased when someone complimented my ability in maths.	.629	
PS7. The mathematics awards I received bring me joy.	.624	
TA1. I am pleased when I accomplished my activities, assignment, projects in mathematics.		.689
TA3. I am fulfilled that I solve mathematics problems on time.		.656
TA2. I loved to accomplish my activities, assignments, projects in mathematics before the deadline.		.652
TA6. I am fulfilled that I can accomplish mathematics task on time.		.540
TA4. I am fulfilled that I solved mathematics problems accurately.		.525

Confirmatory Factor Analysis (CFA)

Following EFA, the test was continued with CFA. The loading factors for each item are shown in Table 5. All items have a loading factor greater than 0.5, indicating a strong correlation within the factor. Similarly, Chen and Tsai (2007) used 0.5 as a cutoff point for factor analysis.

Table 5
Loading Factor in CFA

Items	Factor Loading
SS8. I am fulfilled about my deductive reasoning skills.	.872
SS9. I am fulfilled about my derivation skills	.883
SS7. I am fulfilled about my inductive reasoning skills	.867
SS10. I am fulfilled about my integration skills	.848
SS11. I am fulfilled about my statistical skills.	.826
SS6. I am fulfilled about my logical skills.	.844
SS13. I am fulfilled with my analytical thinking skill.	.813
SS12. I am fulfilled about my critical thinking skill.	.785
SS5. I am fulfilled about my algebraic skills.	.777
SS1. I am fulfilled to derived equations algebraically.	.723
SS2. I am satisfied with my problem-solving skill.	.708
SS4. I am fulfilled that I can use specific measuring tools to measure something.	.696
RL5. Applying mathematics principles in my social life was fulfilling.	.852
RL6. Applying mathematics principles to my family was fulfilling.	.845
RL7. Applying mathematics principles in my spiritual life was fulfilling.	.825
RL4. Applying mathematics principles in work was fulfilling.	.857
RL3. I am satisfied when I solved real-life problems using mathematics.	.832
RL2. Applying mathematics principles in selling or buying something was fulfilling.	.767
RL1. I loved applying mathematics principles in real-life situations.	.777
RL8. Applying mathematics principles to my finances was fulfilling.	.763

RL9. Applying mathematics principles in planning something was fulfilling.	.771
AS7. I am satisfied with the results of my mathematics assignments and activities.	.913
AS5. I am satisfied with the results of my mathematics examination.	.839
AS6. I am satisfied with the results of my mathematics quizzes.	.906
AS8. I am satisfied with the results of my mathematics project.	.914
AS4. I am satisfied with my mathematics performance.	.842
PS5. I appreciate being addressed as Mr. or Mrs. Mathematician.	.815
PS6. The compliments my superiors have made regarding my mathematics abilities fill me with pride.	.796
PS4. I'm happy to be acknowledged for my accomplishments in mathematics by others.	.743
PS1. I was pleased when someone complimented my ability in maths.	.752
PS7. The mathematics awards I received bring me joy.	.784
TA1. I am pleased when I accomplished my activities, assignment, projects in mathematics.	.659
TA3. I am fulfilled that I solve mathematics problems on time.	.863
TA2. I loved to accomplish my activities, assignments, projects in mathematics before the deadline.	.724
TA6. I am fulfilled that I can accomplish mathematics tasks on time.	.864
TA4. I am fulfilled that I solved mathematics problems accurately.	.822

Fit Indices and Validity

The fit indices' findings are shown in Table 6. The figures reveal that all of the necessary requirements for fit indices were met. The Normed Chi-squared CMIN/DF = 2.683 achieved the threshold of 3, the Comparative Fit Index (CFI) of 0.954 is greater than 0.95, the Tucker Lewis Index (TLI) of 0.952 is greater than 0.95, the Goodness of Fit Index (GFI) of 0.956 is greater than 0.95, and the Root Mean Square Error of Approximation (RMSEA) of 0.073 is between the acceptable range of 0.05-0.08. The p-value of 0.057 indicates that the model fits the individual subject's data.

Table 6
Results of Fit Indices.

Measure	Value	Threshold	Interpretation
CMIN	1566.862	-	-
DF	584	-	-
CMIN/DF	2.683	Between 1 and 3	Excellent
CFI	0.954	>0.95	Excellent
TLI	0.952	>0.95	Excellent
GFI	0.956	>0.95	Excellent
RMSEA	0.073	0.05 - 0.08	Acceptable
PClose	0.057	>0.05	Excellent

Tables 6 and 7 indicate that all of the convergent validity indicators are satisfied. Table 7 further demonstrates that all of the square roots of the Average Variance Extracted are larger than the estimated correlation coefficient between components. As a result, the criteria for discriminant validity are also met.

Table 7

Convergent and Discriminant Validity

	CR	AVE	MSV	MaxR(H)	Skill	Real Life	Academic	Praise	Task
Skill	0.957	0.65	0.48	0.962	**(0.806)**				
Real Life	0.945	0.657	0.568	0.948	0.682	**(0.811)**			
Academic	0.947	0.781	0.541	0.951	0.667	0.691	**(0.884)**		
Praise	0.885	0.606	0.604	0.887	0.643	0.637	0.653	**(0.779)**	
Task	0.892	0.625	0.604	0.908	0.693	0.754	0.735	0.777	**(0.791)**

Discussion

Mathematical satisfaction is an essential component of learning mathematics; it may boost motivation to learn mathematics. Mathematics satisfaction is a positive emotional aspect of an individual, and positive emotions boost intrinsic motivation (Løvoll et al., 2017). Furthermore, Attard and Holmes (2020) demonstrate that student satisfaction levels influence mathematics performance. Thus, this research analyzes the 44-item mathematical satisfaction questionnaire, which included the following subscales: praise satisfaction (7 items), skill satisfaction (13 items), task accomplishment (7 items), academic satisfaction (8 items), and real-life situation (9 items). These 44 items were derived from an analysis of interviews with various mathematics teachers and professors. Following face validity, the researcher conducts content validity using Aiken's V approach, with the participation of ten faculty members. The validity of each item to measure a construct is examined by the 10 faculty raters. The 44 items have a validity coefficient greater than the threshold value of 0.73, indicating that each item in the five constructs is valid.

EFA analysis was done after the content validation. Each factor has an Eigenvalue greater than one, implying that the factors should be retained (Goodwyn, 2012). Each item on each component had a loading factor larger than 0.5, and those that did not meet the requirements were deleted. To eliminate measurement errors, it is necessary to drop observed variables with loading factors below 0.5 (Ramasamy & Krishnan, 2011). The EFA analysis yields a five-factor instrument with new item counts in some components. The EFA specifically revealed the five factors that make up the scales for measuring mathematical satisfaction as follows: (a) skill satisfaction has 12 items; (b) real-life satisfaction has 9 items; (c) academic satisfaction has 5 items; (d) praise satisfaction has 5 items; and (e) task accomplishment has 5 items. The CFA was carried out after the exploratory factor analysis. The CFA analysis demonstrates that all of the fit indices criteria were met, confirming the convergent and discriminant validity of each factor.

The findings of the study confirmed the construct validity of the questionnaires. This is in accordance with Mohajan's (2017) assertion that reliability refers to the degree to which any measuring tool controls for random error, while validity refers to what an instrument measures and how well it does so. Thus, results show that the research study effectively established a mathematical satisfaction questionnaire for students in a distinct and broader dimension. Several studies have focused on mathematical satisfaction, but not in a broader sense. For example, Settle and Settle (2005) used solely student assessments of the course and the instructor to determine student satisfaction in mathematics. Ramos et al. (2022), Davis (2014), and Zhu (2012) concentrated on mathematics satisfaction in an online course. Furthermore, González Ramírez and García Hernández (2021), Mahir et al. (2021), and García-Hernández and González-Ramírez (2018) focused on students' satisfaction with mathematics study resources.

Conclusions

This study provided another powerful tool for measuring students' mathematics satisfaction in five categories. The study's primary analysis is exploratory factor analysis, which is followed by confirmatory factor analysis and a validity test. The EFA and CFA analyses yielded five mathematical satisfaction scale constructs. These five factors are as follows: (a) skill satisfaction has 12 items; (b) real-life satisfaction contains 9 items; (c) academic satisfaction contains 5 items; (d) praise satisfaction contains 5 items; and (e) task accomplishment contains 5 items. Students' satisfaction with their skills in various fields of mathematics can be measured using a skill satisfaction scale. The real-life-situation satisfaction questionnaire can assess student satisfaction when they apply mathematics principles in their daily lives. The academic satisfaction scale will measure how satisfied students are with their mathematical achievement. The praise-satisfaction scale can assess students' sense of satisfaction when they are complimented on their mathematical performance. Finally, the task accomplishment scale can provide the degree of satisfaction of students once they have completed a task in mathematics. To the best of his knowledge, the researcher concluded that the instruments were valid and reliable.

Recommendations

School teachers can use the validated instrument to determine students' levels of mathematics satisfaction and utilize it as baseline data for designing interventions. Various researchers interested in mathematics learning may utilize the questionnaire. Future researchers may re-evaluate or modify the items in this study for future research purposes.

Acknowledgements

The researcher would like to thank the DepEd mathematics teachers and the NEUST Gabaldon faculty who served as item validators. The researcher would also like to thank the students who served as responders in this study.

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Received: *April 01, 2023* Revised: *May 10, 2023* Accepted: *June 01, 2023*

Cite as: Capinding, A. T. (2023). Construction and validation of mathematical satisfaction questionnaire: An exploratory and confirmatory factor analysis. *Problems of Education in the 21st Century*, *81*(3), 327-339. https://doi.org/10.33225/pec/23.81.327

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 81, No. 3, 2023

COOPERATIVE LEARNING STRATEGIES: IMPLEMENTATION CHALLENGES IN TEACHER EDUCATION

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Abstract

The research in cooperative learning (CL) is robust. Despite the empirical research benefits of CL, its implementation faces challenges in teacher education classrooms. Teacher educators resist using CL and stick to the frontal teaching method. All this may be due to the difficulties perceived by teacher educators in implementing CL. The researchers used a concurrent triangulation mixed method research design to explore the perceived challenges of cooperative learning implementation among teacher educators from India. The researchers administered a questionnaire and obtained 300 responses from teacher educators through a survey, followed by a semi-structured interview among eight survey participants. The research findings revealed that the average perceived challenges among teacher educators are 63% due to teacher challenges, learner challenges, curriculum syllabus, and administrative challenges. Female teacher educators perceived higher challenges than males. ANOVA results revealed a difference in challenges faced across the age group. These results demonstrate the need for future researchers to conduct a more in-depth examination of the challenges in implementing CL with more extensive samples in various educational settings in other world regions to develop effective solutions.

Keywords: *active learning, collaborative learning, cooperative learning, mixed-method, student-centred learning*

Introduction

The ability to work with others has been one of the most sought-after traits for persons in the professional and educational environments of the twenty-first century. Teacher training programmes are essential for preparing teachers for the classroom and providing them with the information and skills necessary to be effective educators. Teacher preparation programmes may influence innovative teaching strategies like Cooperative Learning (CL). Teachers in the twenty-first century may incorporate technology and creative techniques into their lessons. Consequently, teacher training can result in a more engaging and practical learning environment for pre-service teachers, enabling them to meet the changing needs of learners.

Review of Related Literature

Cooperative learning (CL) is a strategy involving small groups of students working together to achieve a common learning goal. CL improves academic performance, motivation, social skills, and collaboration among pre-service teachers (Gillies, 2016). Abramczyk and Jurkowski (2020) have stated that CL benefits academic and social learning and may provide individualised learning experiences. CL can enhance language proficiency among learners (Namaziandost et al., 2020). CL can allow meaningful disciplinary integration and ease of teaching (Li et al., 2022). Students' critical and creative thinking is significantly improved using CL (Silva et al., 2022). An adequately structured CL ensures fairness, social justice, and equal

https://doi.org/10.33225/pec/23.81.340

learning opportunity. Thus CL practice may foster an inclusive and revolutionary educational environment (Muñoz-Martínez et al., 2020). CL contributes to developing a learning community, enhanced collegiality, a shared learning goal, open discussion, dedication, focused teaching preparation, and facilitated adaptability (Niemi, 2021). All these studies highlight the benefits of CL practice among learners and teachers.

Teachers are crucial in collaborative learning, and the teacher helps students solve problems. So, teacher Education Colleges bear a great deal of responsibility for preparing prospective teachers to use innovative group learning strategies such as CL. In line with the above, implementing CL in classrooms is helped by teacher educators who promote autonomy and structure in the teacher training programme (Cañabate et al., 2021). On the same path, monitoring, assisting and mentoring student interactions are crucial for effective CL implementation in teacher education (Kaendler et al., 2019). Moreover, to achieve this, teacher abilities are essential (van Leeuwen & Janssen, 2019).

Similarly, Farrell and Jacobs (2016) have shown that the effective use of CL practices suffers in the hands of inexperienced and untrained teacher educators. Poor reflection on professional experience is another reason for low desirability for strategies like CL. However, the training teachers receive during their courses can influence their use of innovative methods in the future (Kusumaningrum et al., 2019; Moges, 2019). Besides this, teaching theory in teacher education classrooms determines the nourishment of teaching skills, values, and dispositions among prospective teachers (Johnson & Johnson, 2017).

Furthermore, the experiential learning trainee teachers experience during the training positively impacts their attitudes (Saborit et al., 2016; Zheng & Zhou, 2023). Accordingly, lacking CL practice during teacher training leads to a lack of knowledge about different CL strategies among pre-service teachers. In reality, the implementation of CL is fraught with difficulties due to practical usability in teacher education (Liebech-Lien, 2020; Muñoz-Martínez et al., 2020). In line with this, few studies have highlighted that teacher educators prefer lecture teaching over active learning strategies. There is a gap between teacher educators' claims and the actual practice of CL (Baloche & Brody., 2017). Teacher education employs lecture teaching methods, and trainee teachers lack hands-on experience in CL strategies (Montanero & Tabares, 2020). Loh and Ang (2020) have stated that teaching and learning have varied over time, although the lecture method remains the primary teaching mode in teacher education. Teacher educators strongly believe that only a few methods, like frontal teaching, guarantee success. This belief prevents them from using CL often (Thorburn, 2020). Teachers are sceptical of the positive effects of CL and use only lecture methods of instruction. Furthermore, active learning strategies like CL are uncomfortable for teachers in pre-service training to practice (Baloche & Brody, 2017), and one of the reasons for this is the blind promotion of frontal teaching methods.

However, research confirms that students demand active learning methods, and lecture methods are inappropriate for contemporary learners. Teacher training colleges may prioritise learner-centred pedagogy; however, insufficient learner knowledge and abilities, understanding of its benefits and advantages, overcrowded classrooms, and classroom discipline issues hinder its implementation (du Plessis, 2020). Furthermore, deficient collaboration abilities, competence, and friendships among students contribute to CL implementation difficulties (Le et al., 2018). However, the teachers' concentration on cognitive components of CL caused student teachers to lack collaboration, consistency, support, and equitable participation. Besides, teacher educators do not stress interdependence and cooperation between student teachers (Dzemidzic Kristiansen, 2022). In line with this, the teacher educators must introduce promotive engagement, individual accountability, social skills, and group reflection into CL groups. If integrated properly, students will be inspired to work together to attain group learning goals (Gillies, 2016). However, Cooperative learning support determines whether students actively construct their knowledge during CL sessions (van Leeuwen & Janssen, 2019).

Teachers have a theoretical knowledge of the benefits and principles of CL. However, their professional abilities and teaching methods do not reflect this scientific proof of cooperative learning's success (Abramczyk & Jurkowski, 2020). Additionally, teachers have trouble developing group goals, CL groups, and choosing CL tactics for a particular topic due to their lack of CL strategy understanding. Hence, CL becomes a collaborative effort like any other.

Furthermore, it leads to poor development of classroom management skills (Ghaith, 2018; Kishore, 2016). These contribute to negative opinions among teachers and students about CL (Opdecam & Everaert, 2018). In this regard, Petre (2022) has stated that transferring CL methods to the classroom can be successful if the first training programme for teachers is adequate. Similarly, teachers who receive training in CL are more likely to incorporate them into their teaching, leading to a more engaging and practical learning experience for students. Pre-service teacher training is a fundamental aspect of higher education. Pre-service teacher training decides whether or not classes include professionals who prepare pupils for tomorrow's society. It is not an exaggeration to assert that how teachers educate today's students will significantly influence the future. (Cañabate et al., 2021; Ghaith, 2018; Ghufron & Ermawati, 2018; Keramati & Gillies, 2021; Letina & Vasilj, 2021; Mukuka et al., 2019).

In addition to the above, the studies have shown that teaching practices employed throughout the course and the availability of teaching materials bolster the teacher's confidence in implementing active learning strategies (Haug & Mork, 2021). Besides, the absence of an ideal physical and pedagogical environment, such as furniture arrangement, hampers successful collaborative learning implementation (Asino & Pulay, 2019). Additionally, classroom design influences learning due to the changing pedagogical needs for social contact, cooperation, and student knowledge creation (D'Eon & Zhao, 2022). Furthermore, teachers and students find adjusting to a collaborative learning environment hard when their perspectives are ignored during school planning (Purba et al., 2022). Additionally, the instructors encounter hurdles during their CL Implementation as curriculum design, professional training, and material support do not support them.

Researchers often criticise teacher education for not providing students with the necessary professional skills for their chosen job (Weinberger & Shonfeld, 2020; Dzemidzic Kristiansen et al., 2019). Besides this, there is a shortage of professionally trained teacher educators, and this, combined with a lack of proper infrastructure, resulted in poor pre-service teacher training. The modelling of organisation and implementation of CL strategies has to start in teacher education classrooms (Kimmelmann & Lang., 2019; Keramati & Gillies, 2021; Letina & Vasilj, 2021; Mukuka et al., 2019).

Both teachers and students believe that only teacher-centred methods provide the best learning opportunities for them (Buchs et al., 2017). Teachers and students have misconceptions about CL due to a lack of knowledge and non-exposure to student-centred learning (Ghaith, 2018). Teachers tempt to use excuses such as difficulty maintaining discipline during a CL class. They often opinion CL activity leads to noisy classrooms. More often, teachers blame about lack of student cooperation and curriculum overload. The teacher educators also feel an inadequacy of CL appropriate for teaching different subjects. Teacher educators use these excuses to justify their lack of motivation to use CL effectively (Buchs et al., 2017; Ghaith, 2018; Opdecam & Everaert, 2018). Successful CL requires a methodical approach from teachers and students (Keiler, 2018). Further research is necessary to comprehend instructors' and students' attitudes regarding the active application of CL based on their experiences (Haug & Mork, 2021).

The previously mentioned arguments emphasise the importance of understanding teachers' perceived challenges when integrating CL. From the above discussion, it is evident that the perceived challenges among teachers in implementing CL are due to a variety of factors, including a lack of knowledge and exposure to CL, misconceptions and negative attitudes towards CL, student attitudes and perceptions towards CL, administrative apathy, and lack of resources. A study focused on the challenges above has the potential to reveal noteworthy discoveries concerning the obstacles hindering the extensive implementation of CL. Moreover, conducting comprehensive research into these factors can facilitate the identification of the most salient obstacles and provide insights for devising practical approaches to tackle them.

From the discussion, it is evident that few studies are available in the literature exploring the perceived challenges of teacher educators in implementing CL. Especially the teacher educators working in the teacher education colleges of middle-income countries lack training in implementing CL strategies; also, they come from various multicultural contexts. Thus, they face many challenges, so studying their perceived challenges in CL implementation becomes highly inevitable. This study's inquiry into the perceived challenges teacher educators face in implementing CL has the potential to make a valuable contribution to the existing body of research on CL and teacher education. The study has the potential to contribute novel perspectives on the challenges encountered by teacher educators, thereby enriching forthcoming research in this area.

Furthermore, perceived challenges towards implementing cooperative learning are global. Additionally, teacher education programmes are unique to every country and region, and different statutory bodies regulate these programmes worldwide. However, some common challenges in the global teacher education scenario require modelling. The actual implementation of innovative pedagogic methods like CL is lacking in teacher education programmes. There is a lack of research on whether teacher education programs adequately support CL implementation.

Theoretical Framework

Three distinct theoretical frameworks guided the research. The social cognitive theory proposed by Albert Bandura highlights the significance of social modelling, self-efficacy, and outcome expectations in shaping an individual's behaviour. The challenges associated with implementing cooperative learning may be associated with inadequate social modelling, diminished self-efficacy, and unfavourable outcome expectations. These factors can potentially impede the inclination of teacher educators and pre-service teachers to participate in cooperative learning activities.

The sociocultural theory proposed by Vygotsky elucidates the importance of social interaction in learning. As per this theoretical perspective, learners can derive advantages from engaging in cooperative endeavours that enable the generation of novel insights. Cooperative learning settings allow students to accomplish tasks within their Zone of Proximal Development (ZPD) while obtaining guidance and feedback from peers and educators.

Edward Deci and Richard Ryan's self-determination theory concentrates on autonomy, competence, and relatedness in motivating individuals to engage in cooperative learning. Lack of autonomy, feelings of ineptitude, or a lack of social support can undermine the motivation of pre-service teachers to participate in cooperative learning activities and contribute to the difficulties in implementing cooperative learning.

Research Problem

Teachers have a theoretical knowledge of the benefits and principles of CL. However, their professional abilities and teaching methods do not reflect this scientific proof of cooperative learning's success. Teacher educators talk about innovative pedagogic practices. However, teacher educators teach cooperative learning through frontal teaching methods like the lecture method. Furthermore, teacher educators usually provide theoretical knowledge of CL to pre-service teachers without practical knowledge. However, a handful of enthusiastic teacher educators are trying to implement cooperative learning but face several implementation challenges. So the present study has undertaken to understand the implementation challenges faced by those who attempt to do it.

Research Focus

The present study explored the perceived challenges of CL implementation in teacher education classrooms.

Objectives of the Study

1. To measure the perceived challenges faced by teacher educators towards implementing CL strategies in their classrooms
2. To explore whether the perceived challenges of CL implementation differ among demographic characteristics like gender, age, and years of teaching experiences among teacher educators.
3. To find the correlation between the perceived challenges to cooperative learning implementation with age and years of teaching experience among teacher educators

Research Methodology

General Background

The present study employed a mixed-method research design. The researchers used a concurrent triangulation design (Creswell & Creswell., 2017). Quantitative and qualitative data were collected concurrently in one study under this design. This type of research design aims to validate the findings generated by each method using evidence from the other. The researchers collected quantitative data using a survey questionnaire and qualitative data through a semi-structured interview of the participants. As the study aims to explore the perceived challenges of teacher educators in implementing CL, in-depth information can be obtained only through interviews. However, conducting a quantitative survey with a large sample will produce more generalised results.

In addition, researchers often criticise that teacher education outcomes in middle-income countries are poor and that most active learning strategies, such as CL, are taught theoretically and not demonstrated. Through interviews and a survey of teacher educators, the purpose of the study will be to help researchers comprehend the issue of not demonstrating CL but instead focusing on content instruction. Consequently, quantitative and qualitative data are collected simultaneously, and the quantitative survey and the semi-structured interview evidence validate the present study's findings.

The researchers constructed the Perceived Challenges to CL Implementation (PCCLI) questionnaire with a 5-point Likert scale to collect data quantitatively. The researchers constructed to measure the perceived challenges of teacher educators in implementing CL in line with the existing literature and the study's objectives. Five subject experts validated the scale. The researchers incorporated the recommendations from the experts and established the content validity of the final form of the scale. The final scale included 12 statements, and participants had to mark their responses against each statement based on their knowledge and experiences with CL (strongly disagree, disagree, neutral, agree, and strongly agree). The researchers tested the final scale by administering it to 40 teacher educators and recorded their responses. The internal consistency of the items was determined using Cronbach's alpha. The scale's reliability is determined to be 0.63. The researchers used a semi-structured interview to collect data qualitatively. The semi-structured interview is the most commonly used data collection method, and it is best suited when deep exploration of issues is required (Kallio et al., 2016; Louise Barriball & While, 1994). The researchers created the interview guide and validated it with a panel of subject experts.

The researchers incorporated informed consent in the survey questionnaire and obtained permission from the interview participants. Participation in the survey and interview was entirely voluntary. The researchers have obtained ethical approval for the study from the Institution Review Board of the University. The researchers carried out data collection in August-September month of 2022.

Sample

For the quantitative survey, the researchers employed a convenient sampling technique. According to the National Council of Teacher Education (NCTE) India, there are approximately 17,000 teacher education colleges in India, a country with an extensive geographical area. So surveying such a large sample of teacher educators is not possible, and therefore as a representative sample, the study sent out a survey questionnaire of around 550 teacher educators, out of which obtained 300 successful responses. The researchers took four quartile deviations among the sample based on high, average, and low scores obtained in the survey questionnaire. Two of the four quartiles were randomly picked for the semi-structured interview so that the researchers get various responses. However, the researchers reached saturation during the interview despite the distribution of participants over the quartiles. So the final sample for the semi-structured interview included eight teacher educators. The demographic variables and their classifications based on gender, age, and years of teaching experience are given in Table 1 and Table 2, respectively.

Table 1
Characteristics of the Sample

Male	120
Female	180
Age	33-60 years
Year of teaching experience	2- 34 years

Table 2
Classification of Teacher Educators Based on Gender, Age, and Years of Teaching Experiences

	Classification	Criteria
Age	Beginner	43 years and below
	Mid-career	44 to 51 years
	Senior	52 years and older
Years of teaching experience	Beginner	8 -years and under
	Mid-career	9 to 13 years
	Senior	14 years and above

Table 3
Demographic Details of Interview Participants

Participant	Gender	Age	Years of teaching experience
T1	Female	39	Below 8-years
T3	Female	40	Below 8-years
T4	Female	45	12 years
T5	Female	50	13 years
T6	Female	57	28 years
T2	Male	38	Below 8-years
T7	Male	46	12 years
T8	Male	54	25 years

Instrument and Procedures

The researchers employed two instruments for the present study. They are the Perceived Challenges to Cooperative Learning Implementation (PCCLI) questionnaire with a 5-point Likert scale to collect data quantitatively and an interview guide for the semi-structured interview. The PCCLI was created electronically in Google form. In the Google form, the researchers incorporated sections for collecting informed consent and demographic details of the respondents. For the field study, the researchers distributed the electronic PCCLI questionnaire online. Appendix A contains The PCCLI questionnaire items.

For the interview, the researchers invited the teacher educators via e-mail. The researchers obtained the participants' permission to conduct the interview. Participants could contact the researchers if they could not attend the scheduled interview. To identify the interviewees and maintain confidentiality, the researcher assigned pseudonyms T1, T2, T3...T8. The researchers removed participants' identities from the data, securely stored in a drive only the researchers could access. Table 3 shows the demographic characteristics of the interview participants.

The researchers interviewed the participants through the Google Meet video conferencing platform. Both researchers conducted the interview, recorded it and transcribed it verbatim. After establishing rapport, the interviewer explained the purpose of the study and cleared the interviewee's doubts at the start of the session. During the interview, prompts were given to participants to elicit more information, and the researcher redefined subsequent interview questions based on the responses to each question. Appendix B contains the interview guide.

Data Analysis

The researchers employed independent sample t-tests and ANOVA to explore the relationship between gender, age, and teaching experiences with PCCLI. The researchers used descriptive statistics such as mean, standard deviation and percentages to analyse survey responses to the PCCLI questionnaire. The survey data were statistically analysed using JAMOVI (version 2.3.16) software. The researchers used Tukey-Kramer Post hoc test to confirm the results, where the difference was significant after the ANOVA test.

Thematic analysis is a data analysis method when the researcher wants to learn more about people's views, opinions, knowledge, experiences, or values by analysing qualitative data (Maguire Moira, 2014). For the qualitative approach using semi-structured interviews, the researchers utilised thematic analysis. During the interview, the researcher noted the participants' comments and thoughts. The researcher immediately organised the critical themes that emerged from the interview.

Following the interview, the researcher completed the following steps for the analysis. Following the stages of coding, the researchers did a thorough reading of the transcripts several times.

- The significant themes arrived after reviewing of initial codes several times.
- Reading and rereading to arrive at a major title for the emerging theme and sub-themes, as well as eliminating subjectivity and bias
- Subthemes are condensed further to obtain the true meaning of participants' experiences.
- To maintain validity, the researchers grouped related themes across transcripts. Before defining and naming them, the researcher combined the central theme and subthemes and reviewed them again.

Research Results

In order to test objective 2 of the study, the researchers conducted an independent sample *t*-test between teacher educators' PCCLI under gender. Table 4 shows the results.

Table 4
Independent Samples T-Test between Male and Female Teacher Educators

		Statistic	***df***	***p***
PCCLI	Student's *t*	3.44*	298	<.001
	Welch's *t*	3.57	283	<.001

*Levene's test is significant (*p<0.05*), suggesting a violation of the assumption of equal variances

From Table 4, it is clear that *t (293)* =3.57, *p*<0.05, indicating there is a statistically significant difference exists between male (*M*=36.5, *SD*=3.67) and female teacher educators (*M*=38.2, *SD*=4.39) in PCCLI

The researchers conducted one-way ANOVA between teacher educators' PCCLI under different categories of their years of teaching experiences. Table 5 shows the results.

Table 5
One-Way ANOVA (Fisher's) PCCLI among Different Teaching Experience Groups of Teacher Educators

	F	***df1***	***df2***	***p***
PCCLI	1.39	2	297	.25

From Table 5, it is clear that *F* (2, 297) =1.39, *p*=0.25; *p*>0.05, indicated there is no statistically significant difference in PCCLI between the groups of teacher educators based on their years of teaching experience (Beginner *M*=37.6, *SD*=3.92, Mid-career *M*=36.9, *SD*=3.89, and Senior *M*=37.8, *SD*=4.47).

The researchers conducted one-way ANOVA between teacher educators' PCCLI under different age groups. Table 6 shows the results.

Table 6
One-Way ANOVA (Fisher's) between Different Age Groups

	F	*df1*	*df2*	*p*
PCCLI	3.54	2	297	.030

From Table 6, it is clear that $F(2, 297)=3.54$, $p=0.03$; $p<0.05$, indicated there is a statistically significant difference between the PCCLI between different age groups of teacher educators (Beginner $M=38.2$, $SD=3.92$, (Mid-career $M=36.4$, $SD=3.79$, and (Senior $M=37.8$, $SD=4.29$).

In order to test the interaction effect between Mid-career, Senior, and Beginner teachers, the researcher conducted Tukey Kramar post-hoc test. Table 7 shows the results

Table 7
Tukey Post-Hoc Test – PCCLI

		Mid-career	Senior	Beginner
Mid-career (44 years to 51 years)	*t*-value	—	-2.55	-1.787
	df	—	297	297
	p-value	—	.030	.176
Senior (52 years and above)	*t*-value		—	-0.375
	df		—	297
	p-value		—	0.926
Beginner (43 years and below)	*t*-value			—
	df			—
	p-value			—

From Table 7, the Tukey Kramar Post-hoc test shows an interaction effect between Mid-career and Senior teachers. There is no interaction effect between the Senior teachers and Beginner teachers, and also between Mid-career teachers and Beginner teachers.

To test objective 3, the researchers conducted a correlational analysis of PCCLI between age and years of teaching experience of teacher educators.

The obtained Pierson correlation coefficient ($r=.09$) between PCCLI and teacher educators' age indicated that no correlation exists between PCCLI and the age of teacher educators. The obtained Pierson correlation coefficient ($r=.178$) between PCCLI and teacher educators' years of teaching experience indicated that no correlation exists between PCCLI and teaching experience. However, the findings suggest a positive direction in the correlation.

Interview

Table 8
Themes and Sub-themes

	Themes	Sub-themes
1	Teacher Challenges	Practical knowledge and belief
		Managing classroom
		Implementation confusion
2	Learner Challenges	.Attitude
		Prior exposure to active learning
3	Curriculum	Burden of syllabus
		Too much focus on marks
4	Administrative Challenges	Rigid classroom furniture and inadequate learning materials
		Indifference towards active learning
		Lack of professional development programmes

Teacher Challenges

The analysis provided themes concerning the teacher's challenges with CL implementation. Effective implementation of CL is contingent on various subthemes, including teachers' practical knowledge, beliefs, classroom management skills, and cooperation with colleagues.

Practical Knowledge and Belief

Most teacher educators stated that they are aware of the positive effects of CL on students. However, they believe it is not their preferred strategy for practical application. Teachers also expressed a lack of knowledge about various CL strategies as well as a lack of training for their practical application.

> *T1: I like CL but usually do not use it in class [….] I have used it once or twice [….], teaching using CL is an additional burden, and I think the lecture method is more effective […..]*

> *T2: Whenever I used CL strategies, I found that it encouraged social interaction and discussion and developed communication skills […], but in the typical classroom, it is not practicable owing to many students [….]*

> *T5: I have no practical experience teaching with CL strategies […] it is difficult to prepare lessons using CL [….] I am not familiar with CL strategies […]*

https://doi.org/10.33225/pec/23.81.340

Managing Classroom

The teacher's classroom management skills are related to the previous theme. Most teachers struggled to form CL groups and manage groups during the session.

> *T6: I have used only peer tutoring as a CL strategy [.....] It is not easy to group the students [....]*

> *T8: it is challenging to manage the students in groups [.....]*

> *T4: I allow students to select their group members [.....] I do a group discussion after the end of each session of my lecture [……]*

Implementation Confusion

This sub-theme relates to the previous ones. Many teachers stated that unhealthy competition from colleagues causes them to lose interest in using CL. Many teachers reported that other teachers had a negative attitude and refused to cooperate with CL implementation.

> *T3: I do not see my co-teachers using CL strategies in their classes […]*

> *T4: Whenever I have used any group activity, other teachers will be observing as if I am not teaching at all [....] and they keep enquiring to students about what I was doing in the class [....] whether I have completed my portion or not [....] they feel I am giving burden to students and not teaching them [……] and I have stopped teaching using any innovative strategies in the class [.]*

> *T7: I have tried initially using CL strategies in the class and the responses from students were good [....] but other teachers felt I was collecting lecture notes from students instead of preparing them myself...it hurt me a lot [....]*

Learner Challenges

This theme outlines the learner challenges to the effective implementation of CL. The analysis provided sub-themes such as the learners' Attitude; the prior exposure of the learners to CL influences the successful implementation of CL.

Attitude

The teachers discussed how learners' behaviour and attitudes toward CL sessions affect the session's success. Many teachers stated that while most students enjoy CL sessions, they are not interested in group learning activities and are hesitant to share learning responsibilities.

> *T8: learners enjoy CL classes [.....], and it is not difficult for them to initiate classroom discussion [....], but all the learners are not responsible for their work [.....] it burdens the other group members and they lose their motivation to continue […] it also affects the group performance*

> *T3 learners are not serious about the tasks given [....] They are reluctant to cooperate and often are absent during the session is a tremendous setback [....] because I could not finish sessions as planned.*

> *T8: The learners speak different languages, and some of them are not fluent in the English language, so they shy away from active participation [.....]*

Prior Exposure to Active Learning

This sub-theme relates to the one before it. Most teacher educators stated that the learners' expectations, sociocultural background, home language, and prior exposure only to the lecture teaching method make effective implementation of CL difficult. Prior exposure to CL in previous courses impacts the learners' learning styles and learning experience expectations.

> *T4: students are used only to the lecture method of teaching, and they expect the teachers to re-teach the lesson even after the same topic is learned through CL sessions [....] Some students complain the teacher is overburdening them with additional assignments [....]*
>
> *T3: students are not submitting their learning sheets and peer assessment forms as they feel they did not fetch any additional marks for them [.....]*
>
> *T3: CL leads to group conflicts as some students are dominant, and others keep quiet during the interactions and discussions [.....]; students who are not fluent in English are mocked by other students when they take more time to express their ideas [.....]*
>
> *T1: some students prefer individual work, feel CL sessions are a waste of time, and demand a lecture teaching method [.....]*

Curriculum

The analysis yielded themes about the challenges of implementing CL in teacher education curricula. The semester system's emphasis on syllabi and examinations poses difficulty in successfully implementing CL.

Burden of Syllabus

Almost all teachers stated that the curriculum of teacher preparation programs is overburdened, and it has exhausted teachers and students equally. Many teachers said students dislike additional work due to assignments and other responsibilities. There is not enough time to prepare for CL sessions, so they use the frontal method of instruction.

> *T1: pre-service teacher education in India is overloaded [……] students are burdened with theory and other activities in the semester system [....]*
>
> *T5: I am not getting enough time to prepare for CL classes, so I use only the lecture teaching method [……]*
>
> *T6: there is no time to practice CL strategies in the classroom [....]*

Too much Focus on Marks

This sub-theme relates to the previous one. Most teachers explained that the examination-oriented semester system in teacher preparation focuses solely on grades, and students work solely for grades.

> *T4: The entire programme is credit-based and exam-oriented [....] so much importance is given to final grades or marks [.....] students are reluctant to take up activities that have no provision for getting marks [.....]*

> *T8: students expect a teacher to complete the syllabus and give them notes and materials for learning [….] They do not value or respect the notes prepared by their peers because they fear the CL classes are inadequate to master the concepts[…..]*

Administrative Challenges

This theme describes the challenges teachers face from college administration when implementing CL. Subthemes that emerged from the analysis were the lacking of learning materials in CL, the absence of professional development programmes, the use of wooden classroom furniture, and the management's indifference to active learning strategies.

Rigid Classroom Furniture and Inadequate Learning Materials

Most teachers explained that there are many applicants yearly for teacher education programs, resulting in overcrowded classrooms. The majority of teachers stated that the furniture in the classroom is not flexible enough to conduct CL. Most teacher educators desired proper lesson plans and professional training to implement CL.

> *T5: The classroom furniture does not support CL strategies [….] In our college, there are 100 students, and there is no space in the classroom for group discussion or easy movements [….] grouping of students will take more than 15 minutes […]*

> *T3: there are no materials or proper lesson plans to refer to the practical implementation of CL strategies […..]*

Indifference towards Active Learning

This sub-theme relates to the previous one because most teachers stated that management is unconcerned about teachers' needs and is only concerned with student admission and grades.

> *T6: our management focuses on completing the syllabus, and they are not bothered to assist teachers in implementing strategies like CL […] Management only emphasises the number of admissions and final grades of the students […..]*

> *T7: for administrators, the lecture method is the only effective method of teaching […] my principal insists that I teach them all the concepts and give them lesson notes too [….] There are many pre-service teacher education colleges and competition for admission is high so I do not want to take risks [….]*

Lack of Professional Development Programmes

This sub-theme relates to the previous one because most teacher educators stated that they do not receive professional development programs from their colleges. Most of these teachers are graduates of private teacher education colleges, and the quality of their education and exposure differs from that of teacher educators trained in aided and autonomous training colleges.

> *T5: I feel there is a need for workshops and demo lessons in the teacher education colleges as a professional development activity for teacher educators [….] I want to master CL strategies and need support from the administration [….]*

> *T1: our college is a private college and never conducts a professional development programme for the teacher educators [....], and there is no unity between private, aided, and government colleges [.....] Managements of private/management/un-aided colleges neglect professional development of teacher educators.*
>
> *T3: the management never takes up follow-up of the programme implementation, and I am not motivated to do CL sessions [.....]*

Discussion

Based on the data reported in the preceding section, teacher educators generally accept using CL, but they employ the lecture method to educate pre-service teachers due to their perceived implementation issues (Baloche & Brody., 2017; Han et al., 2015; Khalaily, 2019). However, teacher educators' PCCLI in their classrooms are impediments they expect to face. Real or imagined, these barriers vary by circumstance and individual.

The present research revealed that the PCCLI is high among teacher educators, and gender affects PCCLI. Previous studies showed that teacher gender might affect the learning environment and how pre-service teachers practice CL. Female teachers are more likely to use CL and create a welcoming classroom, which benefits female students. In CL, the teacher's gender may alter students' responses to feedback and evaluation. These differences might be due to the existing gender difference in the higher education system favouring male dominance and students' slight preference for male professors (Arrona-Palacios et al., 2020). However, the interpretation of gender differences is not universal. Furthermore, cultural, societal, and situational influences might influence its interpretation (Aslan et al., 2018).

In addition, the current study revealed that CL implementation issues depend on teacher educators' age. A teacher educator's age can influence their views on CL, teaching and learning. For instance, older teacher educators are hostile to CL as they do not have training or experience in CL as their training was in lecture teaching methods. Young teachers can learn much from seniors, but senior teachers may discourage junior teachers from utilising CL. Influential senior teachers can shape pre-service training or the teaching culture that exists in the college. Senior teachers' dislike of CL may inhibit its college-wide use. Senior teachers' expectations may discourage younger instructors from trying new methods like CL (Saborit et al., 2016).

Moreover, the study's findings demonstrated that teacher educators' teaching experiences do not impact CL implementation. CL can provide challenges for teachers of different experience levels. Experienced educators may have hard-to-change routines, and they may also choose lecture-based teaching over CL. Skilled teachers may examine students individually rather than in groups. However, untrained teachers may be more open to new methods like CL but lack the skills and knowledge to implement them. They may struggle with classroom management, classroom settings, student behaviour and participation goals (Beiki et al., 2020; Hung., 2019; Saborit et al., 2016).

Not many studies explore the relationship between Perceived challenges in implementing cooperative learning with demographic variables like age and years of teaching experiences among teacher educators. However, the correlational analysis of PCCLI with teacher educators' age and teaching experiences showed no correlation between the variables. The age and years of teaching experience are not enough to instil attitudes among teachers to apply cooperative learning in their classrooms, nor is professional training in innovative methods. Instead, it is an awareness of the methodology's purpose (Saborit et al., 2016). However, the findings suggest a positive direction in the correlation, so more profound studies are needed to explore the present study's findings.

Factors Contributing to Teacher Educators Perceived Challenges Towards Cooperative Learning Implementation

Teacher challenges stem from the lack of hands-on experience in CL during teacher education programmes. Lack of practical training affects their beliefs, ability to lead classes, and the confusion over using CL in the classroom. The untrained teachers may not comprehend CL concepts or have the skills and confidence to operate in a CL environment. They might also misunderstand or dislike CL, making implementing these strategies harder (Beiki et al., 2020). A theoretical understanding of CL and its benefits may not prepare teacher educators for CL implementation challenges. A theoretically sound teacher educator might struggle to control group dynamics and student behaviour during CL exercises (Moges, 2019). They might struggle to evaluate group work and provide honest and accurate feedback or adapt CL techniques to diverse learners (Beiki et al., 2020; Duran et al., 2019; Ghaith, 2018; Mukuka et al., 2019; Saborit et al., 2016).

CL is a novel teaching strategy for many pre-service teachers. Pre-service teachers' CL opposition affects teacher educators' CL implementation in various ways. CL-resistant students may hinder teamwork, communication, and problem-solving among pre-service teachers (Asino & Pulay, 2019; du Plessis, 2020; Ghaith, 2018; Khalaily, 2019). Furthermore, Learner challenges mainly arise due to prior experience with active learning. The non-exposure to active learning develops a negative attitude towards CL. Inexperience may make CL's benefits and application harder for prospective teachers (Ghaith, 2018; Weinberger & Shonfeld., 2020). Curriculum pressure may make prioritising CL harder, limiting content coverage time. Eventually, they may not appreciate the benefits of CL and see it as a burden rather than a learning strategy (Kimmelmann & Lang., 2019). Students may expect teachers to provide all the answers rather than self-learning and group construction of knowledge. CL encourages pre-service teachers to work in groups and cooperate, which may be challenging for students who prefer to work alone (D'Eon & Zhao, 2022; Hung, 2019; Letina & Vasilj, 2021; Saborit et al., 2016). Further, the communication styles of learners might hamper CL. Learning a second language or having inadequate language skills might make CL challenging. Pre-service teachers may fail to follow instructions or communicate with classmates, which can annoy them and limit enjoying the benefits of CL. Grouping students who speak various languages might be challenging, which hinders student dialogue and collaboration, lowering CL's effectiveness (Muñoz-Martínez et al.,2020; Namaziandost et al., 2020)). Some cultures prefer working alone, making CL implementation difficult for the teacher. In some cultures, voicing opinions or disagreeing may hinder group debate and collaboration (Nguyen-Phuong-Mai, 2019).

Furthermore, the present study's findings revealed that an overloaded curriculum and too much focus on students' test scores contribute to the high PCCLI among teacher educators. It is related to the practical experience of a teacher educator in CL. A theoretically sound teacher educator may not know how to add CL exercises to the course syllabus, making it hard to finish course subjects on time (Beiki et al., 2020). Without practical experience in CL, the teacher may be unable to adjust CL exercises to fit the time limits to complete the syllabus (Mukuka et al., 2019; Saborit et al., 2016). A teacher educator without experience may struggle to manage the time, and they may not know how to adjust learning activities if they take longer or ensure that all groups finish on time (Ghaith, 2018; Yang et al., 2021).

Overcrowding and wooden furniture might hinder the implementation of CL (Ghaith, 2018; Yang et al., 2021). Overcrowded classrooms make CL exercises in small groups extremely impractical. Too many students may make it difficult for the teacher to move about, assess student progress, and work in small groups (Beiki et al., 2020). The teacher educator faces distractions, lack of focus and inability for learner engagement in large classrooms, which affects the success of CL (Ghaith, 2018; Yang et al., 2021).

According to (Moges, 2019; Li et al., 2022), teacher educators may struggle to implement CL if the administration restricts how and what to teach. Moreover, the management does not support professional development programmes for their teachers. Teacher educators need autonomy to meet student teachers' needs and create successful learning environments. Lack of administrative support and an exam-focused semester system might make adopting CL challenging in teacher education courses, and teacher educators may prioritise content coverage and test preparation over CL implementation (Moges, 2019). It may make people question their ability to do CL classes. Negative opinions regarding CL may also create a culture that perceives CL as an unnecessary or ineffective teaching method.

Keramati and Gillies (2021) have discussed CL constraints as playing a significant role in improving the status of CL implementation. Lack of knowledge and practice in CL is a fear transmitted by co-teachers when they discuss negative experiences with active learning strategies such as CL. It is a reluctance to take risks and venture outside the comfort zone of frontal teaching (Niemi, 2021). A willingness to implement CL sessions may help to address opposing forces (Baloche & Brody, 2017; Ferguson-Patrick, 2020; Gillies, 2016; Khalaily, 2019). According to Baloche and Brody (2017), implementing cooperating lessons can be a fundamental change in teacher education because it improves real learning and improves and empowers trainee teachers for effective teaching and learning. The non-exposure to CL during training may develop negative attitudes toward it or be persuaded not to use it in the classroom (Beiki et al., 2020; Matee et al., 2023; Purba et al., 2022)

Conclusions and Implications

Teacher educators boast about CL, but teacher education programs rarely implement it. The current study explored the teacher educators' perceived challenges in implementing CL in teacher education classrooms. The survey results revealed that the average percentage of perceived challenges towards implementing CL is 63%. Female teacher educators perceived more significant challenges than males. There is a difference in perceived challenges among teacher educators of different ages, whereas teaching experience did not reveal any difference in perceived challenges. The correlational analysis of PCCLI with teacher educators' age and years of teaching experiences showed that no correlation exists between the variables. However, the findings suggest a positive direction in the correlation and suggest the need for more profound studies in the future involving the age and years of teaching experience of teachers and educators with PCCLI. Through thematic analysis of the semi-structured interview, the research revealed significant challenges in the implementation of CL among the teacher educators, such as Teacher challenges, teacher's practical knowledge and belief, learner challenges, learners' prior exposure to active learning, curriculum, administrative challenges, administration's indifference towards active learning, and lack of professional development programmes. These results show that the perceived challenges towards CL implementation hinder its use in the pre-service teacher classroom. However, implementing cooperative learning instils accountability and autonomy in pre-service teachers' learning. It is the teacher educator's responsibility to implement CL for the benefit of their students rather than staying in their comfort zone of frontal teaching.

The researchers conclude by recommending that future researchers conduct more in-depth studies of the issue with larger samples in diverse educational settings and regions of the world and develop more effective approaches to motivate and encourage policymakers, government, administrators, and teacher educators to implement CL strategies as a mainstream of teaching as part of the teacher training programme.

Ethical Approval

The researchers obtained an institutional review board (IRB) certificate of ethical approval for the current study. The application included Participant descriptions, consent forms, and assent forms. The researchers guaranteed that the participants could leave the study at any time if they did not feel comfortable. Only the researchers have access to the encrypted and password-protected collected data.

Conflict of Interest

The authors declare no competing interest.

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Appendix A:
Perceived Challenges to the Cooperative Learning Implementation Scale (PCCLI)

Perceived Challenges to Cooperative Learning Implementation Scale (PCCLIS) items (Strongly Disagree- 1, Disagree-2, Neutral-3, Agree-3, Strongly Agree-5) *items 2, 3, 4, 5, and 7 indicates negative items

1.	It is difficult to complete the syllabus if I use cooperative learning
2.	I believe cooperative learning will not benefit all types of learners*
3.	Students find it difficult to initiate classroom discussion*
4.	Students like individual work more than group work*
5.	Students are not participating actively in cooperative learning*
6.	Classroom seating arrangement poses a challenge to cooperative learning implementation
7.	Usually, I prefer the lecture method over cooperative learning*
8.	It is tedious to prepare for a cooperative learning session
9.	I find cooperative learning classrooms noisy and disturbing
10.	I prefer cooperative learning only for conducting revision
11.	It is difficult to monitor the groups in cooperative learning
12.	Sometimes cooperative learning leads to conflicts

Appendix B:
Semi-structured Interview Items

1. What are your initial thoughts on implementing cooperative learning strategies?
2. What were some of the difficulties you encountered when implementing cooperative learning strategies? Elaborate
3. How did students react during cooperative learning classes? Elaborate
4. What steps did you take to gain control of cooperative learning classes?
5. How confident are you in implementing cooperative learning strategies in your classroom regularly?
6. What were your two most complex challenges while implementing cooperative learning strategies?

Received: *March 03, 2023* Revised: *April 23, 2023* Accepted: *June 04, 2023*

Cite as: Chakyarkandiyil, N., & G. S. Prakasha (2023). Cooperative learning strategies: Implementation challenges in teacher education. *Problems of Education in the 21st Century*, *81*(3), 340-360. https://doi.org/10.33225/pec/23.81.340

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STUDY GROUP SIZE, MOTIVATION AND ENGAGEMENT IN THE DIGITAL ERA

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Abstract

This study explored the relationship between the size of the study group and the motivation and engagement of students in online and face-to-face classes while exploring the effect of personal and academic background variables, the number of students in the study group, and the level of their motivation to study. The study included 122 participants, students in their second, third, or fourth year of academic studies, who had experienced online studies during Covid-19 as well as face-to-face studies. They had all participated in both small classes (35 students or less) and large classes (more than 35 students). The study indicates that there is indeed a significant difference in students' motivation and engagement, irrespective of the size of the study group, and the difference in motivation depends on the method of delivery, whether online or traditional (face-to-face). The research results reveal new knowledge regarding online studies and help enrich the literature on this topic, in the context of motivation for online studies and the size of the study group, which are significant causes underlying students' academic success. It is evident from the study that size does not affect motivation, which is solely the student's responsibility. The challenge of academic institutions and lecturers in the digital era is to raise students' motivation and engagement, irrespective of the study group.

Keywords: *covid-19, higher education, engagement of students, e-learning motivation***,** *face-to-face classes*

Introduction

The Impact of Covid-19 on Higher Education in Israel

The Covid-19 pandemic affected Israel's system of higher education. In mid-March 2020 all schools and institutions of higher education were closed and were forced to deal with a new teaching reality, with no prior preparation. The method of education was changed to e-learning as determined by a "temporary injunction". With no time to adjust and no proper preparation, faculty and students were compelled to adapt to the new technologies and new manners of teaching, learning, and evaluation (Donitsa-Schmidt & Ramot, 2020). As a result of the change regarding physical study spaces, students were required to display greater discipline and motivation (Joia & Lorenzo, 2021).

Although e-learning is not a new pedagogic model and has been in use for many years in different domains, there is still a lack of proficiency in implementing e-learning platforms in schools and institutions of higher education (Almusharraf & Khahro, 2020). One of the difficulties that emerged at this stage was the uncertainty as to for how long e-learning would be employed. Only after three weeks of e-learning did it become clear that this manner of teaching would probably persist until the end of the semester, as was indeed the case (Donitsa-Schmidt & Ramot, 2020).

From this stage on it was clear that, in the long term, e-learning would generate changes and force all those involved to adapt on some level, but its implications could not be predicted. The question is whether the effect would be social, influencing only students' "campus experience",

https://doi.org/10.33225/pec/23.81.361

or would be in a physical classroom where relationships stem from the real presence of all those involved and have real academic meaning. Does online attendance necessarily mean that students have a lower mental presence? Accordingly, could the sharp transition to e-learning constitute a threat to studies per se? This study attempted to explore the shifts in students' engagement in the transition to e-learning, as associated with class size and motivation. The research literature contains extensive information on the association between class size and students' motivation – and the teaching method, whether face-to-face or e- learning.

Literature Review

Transitions Regarding Face-to-Face and e- learning

According to the US Department of Education, e-learning can be defined as "learning that occurs partially or fully by means of the internet" (US Department of Education, 2010, cited by Tan & Chen, 2021). While online and blended learning were a topic of active research and discussion before the pandemic, its emergence created an immediate need for such means of delivering courses (Tan & Chen, 2021). A paradigmatic change occurred, from a traditional pedagogic method to technology-based teaching and learning. From an era when teachers depended on printed study material or a board and chalk, a transition was evident to a technological era where classrooms are combined with virtual platforms such as Zoom. On these platforms, participants do not have to attend class physically but can study from any distance (Ngogi, 2020). Communication between the lecturer and student takes place through viewing (digital camera), speech and listening (microphone and earphones), and sharing screens for presentations and teamwork. Such usage facilitates lessons that resemble those given in regular classrooms (Meishar-Tal & Levenberg, 2021). This situation gave researchers an opportunity to investigate the pros and cons of e-learning (Tan & Chen, 2021).

Pros and Cons of E-Learning

The outbreak of the pandemic indeed led to a sudden transition from face-to-face to online classes. This generated an opportunity for a potential paradigm change involving the use of educational technologies in both formats (Tan & Chen, 2021). The expansion of distance learning might create the change anticipated by the field of education, slowly breaching the financial and local barriers that blocked equal access to high-standard education for all students, sometimes impassably. E-learning allows students to study at any time and place that suits their study needs. Educators and students attested to their ability to focus more on the content of the course while studying online and less on issues such as parking, traffic, and other problems that might arise when participating in a traditional classroom environment (Gilbert, 2015).

The benefits of integrating online environments include developing autonomous learners, where students make their own inquiries and search for information, evaluate, change, and adapt new skills necessary for millennial learners. Moreover, online learning platforms allow students to approach the study material at their own pace. The literature reports that such an environment helps students develop the ability to manage their time and improve self-efficacy. Specifically, online shared activities have a positive impact on increasing skills such as self-awareness, self-regulation related to the effectiveness and meta-cognition of students, and engagement in class. Then again, the research has identified many critical challenges that might affect learning in an online environment. Such challenges include deficits in different areas such as: evaluations of students' academic integrity, internet access, low quality of delivering e-learning, cost control, individual learning, vocational technological training, access to technology, and technical problems. Other challenges are related to teachers' skills of individual adaptation of lectures to e-learning. They must learn to monitor students' cooperation and to design authentic online evaluation tools that accompany the transition from face-to-face encounters to online platforms (Almusharraf & Khahro, 2020). The Covid-19 crisis threw the faculty into the deep end of the online swimming pool instantaneously, with no preparation. Although most make an effort to try, faculty of a certain age (still most faculty members) lack both the experience and the tolerance to learn new and very unfamiliar methods and technologies. Therefore, e-learning requires different skills, including pedagogic skills, design skills, technical skills, and communication capabilities (Almusharraf & Khahro, 2020). Despite the practical differences in learning between the course formats, a study that compared traditional face-to-face courses and online courses proved that online courses can be as efficient as traditional courses (Dixson, 2015). Another study, however, argues that students fundamentally do not do as well in online courses as in courses held in a face-to-face study environment, because not only does learning in a virtual environment enforce a physical separation between students and lecturers, rather the physical separation also creates a psychological and communication gap (Cung et al., 2018).

E-learning might delay students' academic progress in the absence of high-quality teaching. Almusharraf and Khahro (2020) noted that it is necessary to strictly monitor the choice of online activities, readings, materials, and contribution of the efforts made in order to meet students' expectations and abilities, before their integration into the lesson plan.

A study (Almusharraf & Khahro, 2020) indicated that students' satisfaction rises according to their success in meeting learning goals. This indicates that the participants perceived e-learning platforms as experiential and constructive learning environments. The high satisfaction of the participants might stem from the association with various factors such as the level of support received from the instructors (for example, one-on-one feedback, individual adaptation of studies, personal attention, availability after school hours) or the multi-modal online delivery of the course (for instance audio, video, texts, slides, games, and PowerPoint quiz). Moreover, the educator's method of teaching and support (e-mail, telephone conversations, and virtual encounters) as well as the teaching approaches (for instance active study opportunities, demonstrations, games, group and individual discussion) should also be taken into account. It is also extremely important to relate to the necessary engagement in the course, manifested in an active class versus learning based on listening to lectures (Almusharraf & Khahro, 2020).

Active Learning: Student Engagement in Teaching Processes

Student engagement usually means the degree to which students are actively engaged through thinking, speech, and interaction with the course contents, the rest of the students in the course, and the lecturer. Student engagement is a major component in maintaining a connection between the students and the course, and therefore between them and their learning. Active learning is a general concept that relates to learning methods that actively and independently involve the student in the process of learning and internalizing (Wright et al., 2019). Therefore, the ability to efficiently measure student engagement is essential for researchers and online instructors (Dixson, 2015). Student engagement is generated by active learning techniques, and these are aimed at demanding higher-order thinking tasks such as analysis, synthesis, and evaluation (Wright et al., 2019).

There is a moderately significant correlation between student engagement and the cognitive experience, as well as between the social experience and the general experience. Furthermore, a positive correlation was found between the level of empathy displayed by the lecturers towards the students in class and their engagement in it, such that the higher the lecturer's empathy the higher students' engagement in class (Meishar-Tal & Levenberg, 2021). In an online environment, students' engagement is important for developing academic independence. Student activity includes independent inquiry, acclimation to technological changes, acquiring skills, and seeking and evaluating information. The online environment helps students manage their time and acquire a sense of self-efficacy, as well as contributing to the student's engagement in the material and engagement in class (Almusharraf & Khahro, 2020).

Hence, in online learning students were found to be engaged in class to a moderate to high degree, where the main manifestation of their engagement was presence in online lessons, passive listening, and performing the tasks and activities initiated by the lecturers (Meishar-Tal & Levenberg, 2021). However, interpersonal interactions significantly improve students' course performance on all outcome measures. In online courses, holding discussions in forums allows students to take an active part in the learning process. Discussions are a major component in forming a relationship and in experiential learning. These aspects of participation and of peer interaction also contribute to developing critical thinking, reflection, and higher-order thinking.

Students' achievements in online courses can improve significantly given well-structured interpersonal communication, for instance through electronic mail and an individual weekly office hour for answering students' questions. In addition, a correlation was found between the level of active participation in an online forum and students' success in the course. The more messages they wrote about the study material and the more they contributed to discussions of the material, this predicted their final grades (Chung et al., 2018; Parks-Stamm et al., 2017).

Another study that examined student participation in online courses found that active participation by students in discussions on digital forums in online courses is important for learning. In small classes of up to 15 students, lecturer participation in forums increases students' participation, and in medium classes of 15-30 lecturers' participation does not affect students' participation, indicating the significance of the perceived personal connection to students' active learning (Parks-Stamm et al., 2017).

Beyond the discussions and engagement in the study material, another element of active learning is manifested in the presence of the lesson. In e-learning, in some cases students reported that they only turned on the camera occasionally and that they had been busy with other things during class, raising the possibility that they were only physically present in the class but not cognitively (Meishar-Tal & Levenberg, 2021).

It is important to examine intrinsic motivators as components of successful online courses that stimulate students. Self-regulation and motivation have been identified as two critical factors for determining success in online courses. Self-regulation can be defined as "students' ability to plan, monitor, and evaluate their behavior, cognitive, and learning strategies" (Meishar-Tal & Levenberg, 2021). Students with high self-regulation used time management frequently, reviewed the material regularly, sought the help of professors or peers, were punctual, and had the meta-cognitive capacity to reflect on their learning. Students who did not regulate themselves tended to display academic procrastination, increased disorganization, and made less use of cognitive and meta-cognitive strategies to achieve their learning goals (Gilbert, 2015). According to Gilbert (2015), maintaining motivation in an online course is a challenge for many students.

Motivation

Motivation is defined as the total of all factors that cause one to take action. Classically, motivation is divided into two concepts: Intrinsic motivation relates to actions performed "for the act itself" or for the interest and pleasure that it contains. Extrinsic motivation includes behaviors performed for reasons other than the satisfaction of performing them (Ryan & Deci, 2020).

There is widespread research agreement that motivation is one of the crucial factors that affect academic success (Smart & Cappel, 2006). The definition of academic success contains up to six components: academic achievements (manifested in one's grades), satisfaction, acquiring skills and capabilities, perseverance, achieving learning goals, and success in one's career (York et al., 2015). Intrinsic motivation is consistently connected to high academic functioning and leads to a better-established foundation for achievements. This is a diverse and complex issue as it changes individually (Ryan & Deci, 2020).

Motivation has been defined as one of the key factors that affect academic achievements. It has also been argued that higher motivation will lead to an outcome of making greater efforts for one's studies and has been associated with how students relate to and approach the fulfillment of challenging tasks (Bandiera et al., 2010; Madlan & Richards, 2016; Micari & Pazos, 2012). Gilbert (2015) further says that students who show a lack of motivation, whether intrinsic or extrinsic, might easily forget the initial goal of their academic studies, get lost in the process, and finally even leave. Among the important factors that affect students' motivation are students' interest in the studied contents, as well as the perceived relevance of the course, or in other words, is it interesting and is the studied material perceived as meaningful for their future work life? If the students see that they will benefit from the course contents, their motivation to study will probably grow (Smart & Cappel, 2006).

Madlan and Richards (2016) described a positive motivational circle, where motivation is driven by personal and social needs. The initial motivation to study in order to earn grades is expected to lead to social learning, which in turn leads to motivation for socialization (creating social ties). Socialization encourages motivation to learn, and they reinforce each other.

Another meaningful aspect related to building motivation in one's studies is the personal relationship and interest expressed by the lecturer. Engagement in studies, interaction, cooperation, and interpersonal communication have been identified as meaningful components for academic success and their existence leads to motivation to learn, even in courses considered particularly difficult. Academic cooperation creates a motivational incentive that leads to higher grades as well as to motivation by virtue of the interaction (Bandiera et al., 2010; Madlan & Richards, 2016; Micari & Pazos, 2012).

Class Size

Another factor that might contribute to students' participation in online discussions is the class size (Parks-Stamm et al., 2017). According to Wilson (2002), the concept of class size relates to "the total number of students allocated to a teacher for all or part of his teaching schedule" (Parks-Stamm et al., 2017). In other words, class size is the number of students in a given class with a teacher. Following this definition, several studies tried to determine the ideal number of students in large and small classes (Almulla, 2015).

For many years, class size was the focus of disputes and intensive investigations. A considerable part of the debate regarding class size was the question of whether reducing the number of students in a class has a positive effect on students' achievements. An interesting feature of the discussion on class size is the well-established contradiction between the view of most teachers, teacher assistants, parents, and some of the researchers, who feel that small classes are beneficial for teaching and learning, and the alternate view usually advocated by economists, policymakers, and think teams, whereby small classes have no significance for the quality of learning (Blatchford & Russell, 2019). Large classes are usually identified with noise, crowding, and heterogeneity, while small classes might be perceived as an extended version of a private lesson, where each student receives personally adapted individual attention (Shafrir et al., 2016).

Studies on the effects of class size in high school examined a wide variety of outcomes, including achievements, student engagement, attitude, and student evaluations of teaching. The research literature consistently supports the concept whereby students perceive an improved learning experience when class size is diminished. For example, students tend to allocate higher ratings to instructors and courses when the class size is smaller. Moreover, students in small classes report high learning output, engagement, and a more positive approach to discipline. The suggested reasons for this greater engagement include pedagogy, where instructors in small classes use more active study approaches, and personal adaptation, where students receive more personal attention in small contexts. A study conducted at a medium-sized British polytechnic confirms these findings. The researchers discovered that students in large first-year introductory courses experienced feelings of anonymity and lack of desire to speak or ask questions. Similarly, instructors reported difficulty forming relationships with students in large classes (Wright et al., 2019).

Students in “large” classes (defined by Parks-Stamm et al. as more than 34 students) participate less in class than those in medium or small groups, but the ideal class size in the small-medium range is debatable. Larger groups afford more interaction between students. However larger online discussions might cause “information overload”, reduced teacher-student interaction, or a reflection of psychological barriers to participation in traditional lessons (for instance, shyness). Some claim that the quality of feedback the instructor provides to students might be reduced in large classes and that the lecturer’s overall performance is perceived as diminished, which might lead to a general drop in the course quality (Parks-Stamm et al., 2017; Sorensen, 2015).

In addition, the Jewish approach, following Maimonides, is that a teacher can teach only up to 25 students and if there are more students an assistant teacher must be added. Class size is an issue that must be addressed particularly in the context of online studies. The main benefit of this form of study seems to be that a larger number of students can be taught in one classroom since virtual space is unlimited (Sorensen, 2015).

Student Engagement

Student engagement in class has an important impact on their achievements and learning process. Responsibility for student engagement in learning is divided to a large degree between the students themselves and the teaching staff. But while the student must display willingness and effort to be engaged and active, teachers must provide the conditions for the learning process and generate situations that arouse engagement (Kahu & Nelson, 2018). The significance of students’ engagement in online courses is no different in this context than when studying in a physical classroom, but it is more challenging due to the special conditions of both students and lecturers (Park & Kim, 2020). The distance between students and lecturers and among students themselves requires a special effort to form an interaction between the lecturer and students and among students. Bollinger and Martin (2018) examined the significance that students ascribe to different strategies of generating student engagement in online classes. They discovered that students highly appreciate lecturers’ efforts to maintain communication and contact with the students, as well as to respond quickly and provide feedback, and their contribution to students’ engagement in online courses, but are less appreciative of attempts to involve them in active and collaborative learning in class and at home. These findings are compatible with the findings of previous studies on student attitudes to active learning and collaborative learning, which indicate that students who switch to online learning prefer to preserve the traditional face-to-face model of learning based on delivering information from the lecturer to the students and are less satisfied with attempts to integrate other teaching strategies (Selwyn, 2011; Smith & Cardaciotto, 2011; Wong & Fong, 2014).

Rationale

This study explored the relationship between the size of the study group and the motivation and engagement of students studying online or face-to-face while inspecting the effect of personal and academic background variables, the number of students in the study group, and their motivation to learn.

Research Questions

1. Do personal (gender and age) and academic (year of studies and discipline) background measures affect students' degree of engagement and their motivation when studying face-to-face or online, and to what extent?
2. Does the number of students in the study group affect students' engagement and motivation, when studying face-to-face or online, and to what extent?

Research Methodology

The study is a quantitative study based on questionnaires distributed on digital media to students in their second, third, or fourth year of studies in Israeli universities who had studied in both face-to-face and e-learning methods. The study was conducted during the 2021-2022 school year, and it focused on a case study of a university in Israel that is typical of Israeli research universities, which engage in research and academic teaching.

Research Sample

The research participants were 122 students in their second, third, or fourth year of studies or subsequently at institutions of higher education in Israel, who had experienced e-learning studies during Covid-19 and also had experience with face-to-face studies. During the Covid-19 and lockdown period, the universities taught via e-learning by Zoom. After this period, for reasons of student convenience and their demand to continue video recording the lessons and to require less physical attendance while allowing them to study at least one or two days a week via e-learning, the universities consented to this demand.

All participants completed an informed consent form (which confirms that participants understand their rights, accept the conditions of the study, and are participating willingly in the study) before proceeding to complete the questionnaires. They all took part in small classes (up to 35 students) and in large classes (more than 35 students). Of these, 89 were women (73%) and 33 were men (27%), aged 20-58 ($M = 25.51$, $SD = 5.59$). About half the students were in their second year of studies (48.4%), 45.9% in their third year, and the remainder in their fourth year (5.7%). Most were studying behavior sciences and psychology or engineering and computer studies (61.5%). The respondents were located by convenience sampling. Some of the respondents were located based on previous acquaintance with the researchers and the rest through social networks (Facebook, Instagram).

Tools

The research tools included five questionnaires that were distributed to the students:

1. **Questionnaire on personal information** – developed for the current study and including personal information on the respondents. The information included: gender (female/male), age (in years), year of studies, and study discipline.

2. **Questionnaire on engagement** – taken from the article “The impact of students’ active participation and lecturers’ performance on students’ learning experience of students during the Covid-19 outbreak” (Meishar-Tal & Levenberg, 2021). The purpose of the questionnaire was to measure students’ level of active engagement in class. The questionnaire consists of 8 statements, for example: “My attendance of online lessons is greater than my attendance of face-to-face classes”. Respondents were requested to answer on a scale ranging from 1=not at all, to 5=very much. Items 4 and 6 were reversed. The final score was calculated by summing all item scores, where the possible overall score ranged from 8-40. A high score attests to higher engagement in online studies than in face-to-face studies. All statements aside from 4 and 6 were reformulated by the researchers in order to adapt the questionnaire to the study and relate to the two manners of delivery. Cronbach’s alpha reliability of the questionnaire was 0.79.
3. **Questionnaire on class size** – developed by the current researchers due to the lack of precise questionnaires on this domain in the research literature. The questionnaire relates to class size (a small class is defined as one that contains up to 35 students and a large class of more than 35 students). The purpose of the questionnaire is to examine the student’s engagement relative to the class size and manner of teaching. It included 4 items, for example: “I am more meticulous about attending lectures in a larger class than in a small class”. The participants were asked to respond on a scale ranging from 1=not at all, to 5=very much. Item 2 was reversed. Participants were asked to complete this questionnaire twice – once for face-to-face studies and a second time for online studies. The score for the questionnaire was comprised of the sum of all responses (range 5-20). A higher score indicates greater engagement in a large class than in a small class. Cronbach’s alpha reliability of the questionnaire was 0.74 for the face-to-face class and .68 for the online class.
4. **Questionnaire on engagement, manner of delivery (face-to-face/online), motivation, student-faculty relationship** – developed by Prof. Nitza Davidovitch. The questionnaire includes 11 items. The participants were asked to respond on a 5-point scale ranging from 1=not at all, to 5=very much. For example: “When teaching in a face-to-face class the lecturer is more attentive to students than in an online class”. The final score is comprised of the sum of all responses (range 4-16). A high score attests to a better relationship of the lecturer with the students in face-to-face learning than in online learning. Cronbach’s alpha reliability of the questionnaire was .81.
5. **Questionnaire on motivation** (Motivated Strategies for Learning Questionnaire – MSLQ) – five questions that were appropriate for the research needs were utilized. The questionnaire consists of 5 items, for example: “I have great interest in the content field taught in this course”. The participants were asked to respond on a 5-point scale ranging from 1=not true at all, to 5=very true. The total score on the questionnaire is comprised of the sum of all items (range 5-25). A high score indicates high motivation to learn and a low score low motivation to learn. Cronbach’s alpha reliability of the questionnaire was 0.86 for face-to-face studies and 0.79 for online studies.

Procedure

The respondents were asked to read and sign an informed consent form to participate in the study and then answer the questionnaire. The participant received, by e-mail, WhatsApp, or social networks, a link to an explanation and to the research questionnaire, prepared through Google Docs. The link was sent to them personally. The participants were told that after completing the questionnaire the data would automatically be transferred to the researchers, with no identifying details. In this method of distribution, most questionnaires arrived fully completed. The order of the questionnaires completed by participants in the study was constant, as follows: personal information, engagement, class size, student-faculty relationship, and motivation.

Data Analysis

As reported by the participants, completion of the questionnaire took about 15 minutes. After the data were collected, the questionnaires were processed using the SPSS program. Means and standard deviations for class size, student-faculty relationship, and motivation by type of studies were calculated to study distributions of research variables. Then, associations between research and background variables were studied by Spearman rank correlations. To answer the research questions, the correlations between the research variables were examined by Pearson correlations.

Research Results

Correlations Between the Research Variables

Table 1 below presents the correlations between the research variables.

Table 1
Pearson Correlations Between Engagement, Class Size, Student-faculty Relationship, and Motivation (n=122)

	Class size face-to-face	Class size online	Student-faculty relationship	Engagement in class	Motivation face-to-face
Class size face-to-face					
Class size online	**46.				
Student-faculty relationship	02.	11.			
Engagement in class	08.-	05.	**36.-		
Motivation face-to-face	14.	13.	**27.	02.	
Motivation online	17.	**31.	*20.	09.	**79

*$p < .05$, **$p < .01$

It is clear from the table that there is a significant positive correlation between student engagement in an online class by class size and their motivation in an online class ($r = .31$, $p < .01$). In addition, a significant positive correlation was found between student-faculty relationship and motivation in a face-to-face class ($r = .27$, $p < .01$) and motivation in an online class ($r = .20$, $p < .05$) and a significant negative correlation with engagement in class ($r = -.36$, $p < .01$).

Correlations Between the Background Variables and the Research Variables

The dependences between variables (background and research variables)

were scored by Spearman correlations. Statistical differences of these correlations were estimated based on Student's distribution (t-test). The results showed a significant correlation between age and engagement ($r = .20$, $p < .05$), such that the older the student the greater the engagement in online studies rather that in face-to-face studies.

The two research questions asked whether there is a difference in students' engagement in learning in an online course versus in face-to-face studies, by class size, motivation, and student-faculty relationship. To explore this, analyses of variance with repeated measures were conducted, with age being the controlled variable. Table 2 below presents the means, standard deviations, and different results of the analysis.

Table 2

Means and Standard Deviations for Class Size, Student-Faculty Relationship, and Motivation, by Type of Studies

	Face-to-face studies		**Online studies**		
	M	*SD*	*M*	*SD*	*F*
Class size	8.63	3.50	7.42	2.30	1.57
Motivation	20.12	4.13	16.12	3.76	**9.59
Student-faculty relationship	18.52	6.09	13.71	4.03	99.

*$p < .05$, **$p < .01$

It is evident from the research findings that:

- There is a significant difference in the motivation of students between face-to-face and online learning, $F(1,120) = 9.59$, $p < .01$. Namely, students' motivation to learn is higher in face-to-face learning than in online learning.
- There is no difference in students' engagement between face-to-face and online learning by class size, $F(1,120) = 1.57$, n.s.
- There is no difference in students' engagement between face-to-face and online learning by student-faculty relationship, $F(1,120) = .99$.

Discussion

The current research attempted to examine students' engagement and their motivation to learn with the two teaching tools (e-learning/face-to-face) as affected by class size and students' level of motivation and engagement. The research literature indicates a possible difference in the perception of students' engagement as well as in the levels of motivation and student-faculty relationship as affected by class size and how the class is delivered, where students' engagement usually improves with the decline in class size. This is also true of motivation (Parks-Stamm et al., 2017; Sorensen, 2015; Wright et al., 2019).

The research findings uncovered a significant difference in motivation as affected by how the lesson is delivered. In face-to-face lessons students reported more than in e-learning lessons. No statistical difference was found in students' engagement in the two manners of delivery as affected by class size. The issue of motivation to study in the two delivery methods is meaningful with regard to the future method of studies in the context of e-learning, studies, as motivation is important for students' success in their academic studies (Davidovitch & Wadmany, 2021; Smart & Cappel, 2006).

The research findings reveal new knowledge on e-learning studies and help enrich the literature on this topic regarding the issue of motivation in e-learning studies and the size of the study group, which are meaningful factors for students' success in their academic studies. It is evident from the study that the size does not affect motivation, which is solely the student's responsibility. The challenge of academic institutions and lecturers in the digital era is to raise students' motivation and engagement, irrespective of the study group.

Digital learning might attract a large number of students to these courses. This reduces the costs of the academic institution, which will open large courses in the name of progress and innovation. But what about pedagogic considerations? What happens to students with different backgrounds and motivation? Centers for the promotion of teaching and learning at academic institutions are charged with preparing for strengthening the pedagogy of developing and using digital courses, as well as preparing teams of teacher assistants who will provide further support to small work groups. Even in large courses it is necessary to develop channels for human contact and interpersonal interaction with the students. Caution should be taken to avoid capitalist tendencies of commercializing courses, stressing profits at the expense of high standard learning that will nurture contemporary learners who live in a world of the revolution of tools without losing the human side of our life.

Conclusion and Implications

This study explored the association between the size of the study group and the motivation and engagement of students studying online or face-to-face, while examining the influence of personal and academic background variables, the number of students in the study group, and their level of motivation to study. The study indicates that there is indeed a significant difference in students' motivation and engagement, irrespective of the size of the study group, and the difference in motivation depends on how the class is delivered, whether online or in a traditional face-to-face mode.

No difference was found in students' engagement between face-to-face and online learning by class size. This can be explained by several reasons: First, it is evident from the research literature that there is a lack of information regarding the issue of online studies in general. The research literature established that students' engagement rises with the decline in class size, but this literature addresses face-to-face classes only. No empirical research has been conducted on student engagement as affected by class size in online lessons.

It is evident from the research findings that a significant difference was found in students' motivation between face-to-face and online learning, such that the motivation of students to learn is higher in face-to-face studies than in online studies. Low levels of motivation may have been found in online learning for reasons that are unrelated to the type of teaching but rather to the period in which it was experienced. Online studies among the students in the current study began during Covid-19, a complex and uncertain period that strongly affected people's mental state throughout the world.

Declaration of Interest

The authors declare no competing interest.

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Received: *March 22, 2023* Revised: *May 09, 2023* Accepted: *June 02, 2023*

Cite as: Davidovitch, N., & Yavich, R. (2023). Study group size, motivation and engagement in the digital era. *Problems of Education in the 21st Century*, *81*(3), 361-373. https://doi.org/10.33225/pec/23.81.361

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 81, No. 3, 2023

HUMOR DEVELOPMENT IN PRESCHOOL AND PRIMARY SCHOOL CHILDREN IN TURKIYE

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Abstract

Knowing humor development can be rather beneficial in terms of providing opportunities to better know children and evaluate their development. This study aimed to explore the process of humor development in preschool and primary school children in line with McGhee's humor development theory. The study employed a single screening model, specifically one of the commonly used screening models in general practice. The study group consisted of 101 children ranging in age from 2 to 11. Research data were collected through a 5.01-minute-long video which included scenes suitable for the stages in McGhee's humor development theory, semi-structured observation forms and a research diary. Descriptive analyses and content analyses were used to analyze research data. Children aged 2 produced the lowest amount of laughter response in the scenes in all stages, followed by those aged 3 and 4. The strongest laughter response occurred in 5-year-old children to the scenes pertaining to stages 2, 3, and 4. The scenes in stage 5 elicited the strongest laughter response in children aged 11. The humor development characteristics of the children in this study were found to be consistent with the general principles of McGhee's theory of humor development. Adopting research techniques that measure children's reactions to real-life situations could be useful in future research on the same topic. Research on children's production of humor may provide different insights into the development of humor. It is suggested that adults, such as parents and teachers, use examples of humor that are appropriate for the characteristics identified in this study and similar studies in order to build positive relationships with children.

Keywords: *humor development, child development, preschool education, incongruity theory, humor theories*

Introduction

Humor is a phenomenon that occurs in all areas of life and helps make life easier and emerges when the mind discovers inconsistency in situations, events, or behaviors (Martin, 2007), and results in laughter (Nesin, 2002). There exist several theories and views on the manifestation of humor (Bergson, 2011; Freud, 1993; Morreal, 1997; Platon, 1998), which can basically be dealt with under three groups: superiority, incongruity, and relaxation. According to the superiority theory, laughter is an expression of a person's feelings of superiority over other people and occurs in situations where someone else's fault or disadvantage is observed (Güler & Güler, 2010). Incongruity theory suggests that laughter arises from the mind's surprise at encountering unexpected or contradictory elements in a situation and can be triggered when an individual accustomed to experiencing the world in a predictable and patterned way encounters something that does not fit these patterns (Morreal, 1997). According to McGhee (1972), dissonance, or the perception of inconsistency or incongruity, is necessary for humor to occur, as it is the mind's way of processing and coping with unexpected or contradictory situations. In order to understand and appreciate humor, an individual must have a basic understanding of how situations and concepts should be, as this provides a frame of reference for understanding the incongruity that underlies humor. In other words, having a cognitive mastery of the

https://doi.org/10.33225/pec/23.81.374

ISSN 1822-7864 (Print) ISSN 2538-7111 (Online)

expected patterns and norms of a given situation is necessary for an individual to recognize and appreciate the deviations from those patterns that create humor. The views of McGhee, who put forward the theory of humor development for children, could also be thought to belong within the incongruity theory. Relaxation theory argues that laughter serves as a way for individuals to release excess energy and tension. This energy discharge primarily occurs through the muscles, particularly those involved in speech, as laughter is a vocalized expression of emotion. When the energy discharge through these channels is not sufficient, it can also be released through the diaphragm and other muscles involved in breathing, resulting in more intense or prolonged laughter. If there is still excess energy that needs to be released, an individual may laugh by clapping their hands, leaning back and forth, or engaging in other physical behaviors that help drain such energy. This theory suggests that laughter serves as a way to reduce tension and promote relaxation (Morreal, 1997).

McGhee (2002) examined the development of humor in children in accordance with Piaget's cognitive development theory and put forward his own theory consisting of five stages, suggesting that the humor examples that individuals understand and produce show qualitative differences with age depending on the cognitive development stages. In stage zero, or laughter without humor (first 6 months), babies often laugh with no humor being present. In the first stage, laughter at the attachment figure (6 months-12/15 months), children laugh at unfamiliar actions of their parents. In the second stage, inconsistent behavior towards objects (12/15 months – 3/4/5 years), the child usually starts to produce the earliest examples of humor. Once an object becomes quite familiar to the child, he or she enjoys using such objects in unusual and inappropriate ways. In the third stage, misnaming objects, events, and people (2-3/4 years), children start playing with words, calling objects by wrong names. The fourth stage, conceptual incongruity (3-5 years), is divided into 4 categories: a. In the category of playing with the sounds of words (not their meanings), children adapt to the sounds of the words and start playing with the sounds of the words themselves. b. In the category of a combination of meaningless and real words, children like to put words together in absurd ways even though they know they are wrong. c. In the category of objects distorting the characteristics of people or animals, children enjoy adding features that do not belong to people, animals, or objects, deleting existing attributes, and changing the size, color or shape of things they know. They laugh at events, people, inconsistent and impossible behaviors with exaggerated features. d. In the opposite-sex naming category, children find it quite amusing when other children are called by a name of the opposite sex or by a name associated with the opposite sex. In stage 5, riddles and jokes (multiple meanings) (6/7-10/11), children can understand humorous jokes and riddles featuring words with double meanings or ambiguity (McGhee, 2002).

Research on the development of humor appreciation in children and its changes throughout the lifespan began in the 20th century and still continues to be a topic of interest for many researchers from all across the globe (Angeleri & Airenti, 2014; Chapman, 1973; Coates&Coates, 2020; Guo, 2008; Halfpenny & James, 2020; Hoicka & Akhtar, 2012; Justin, 1932; Krogh, 1985; Loizou 2005; Loizou, 2006; Loizou, 2007; McGhee, 1971; Sahayu et al., 2021; Stenius Karlssona & Sivenius, 2022). In Turkey, on the other hand, research into how the appreciation of humor develops with age throughout child development has only started in the 21st century (Ak Seven, 2012; Kızıltan, 2006; Koçer et al., 2012; Yalçıntaş Sezgin & Hatipoğlu, 2017; Gültekin & Ulutaş, 2022; Yılmaz & Tantekin Erden, 2022). Studies conducted in Turkey mostly tend to examine the humor styles of adolescents or teachers in terms of various variables and personality traits, and associate the use of humor in school branch lessons with student achievement and attitudes towards lessons (Akkaya, 2011; Aslan, 2006; Avşar, 2008; Aydın, 2006; Çelik, 2006; Kahraman, 2009; Karagöz, 2009; Kılınç, 2008; Oruç, 2006; Özkan, 2008; Savaş, 2009; Sepetci, 2010; Soyaldın, 2007; Sümer, 2008; Ulus et al.2019; Yerlikaya, 2007; Yerlikaya, 2009). Studies exploring the evolution of humor in various cultures and the impact of humor on learning and personal growth can provide insight into cultural differences, but they also have the potential to identify common characteristics in the development of universal humor across cultures.

In addition to McGhee's explanations, research on the development of humor in children from various regions around the world also sheds light on how humor develops during a child's growth. In a study conducted by Stenius Karlssona and Sivenius (2022) in three different early childhood centres to identify the humor elements of young children by observing the children's own expressions, it was found that children's use of humor did not occur as a separate activity but emerged as a part of play and acting. They reported that children's humor rarely included situations such as telling jokes or laughing at misfortunes. Previous work by Sahayu et al. (2021) with Indonesian children aged 1-5 determined that children aged 1-5 were able to perceive and produce non-verbal and verbal humor. The study also found that humor production and development naturally increase as children interact in their social environment.

There is evidence that incorporating humor into educational settings can have a positive impact on children's development and learning. McGhee (2002) has noted that humor can support the development of creativity, cognitive skills, reading skills, vocabulary, and language skills in children. He states that humor facilitates social communication among children, increases likability, and enables them to express anger in a socially acceptable way, claiming that the joy and happiness of children not only contribute to their self-esteem but also help them cope with life stress and contribute to their physical health (McGhee, 2002). Stenius Karlssona and Sivenius (2022) found that young children frequently use humor to assert their presence and liven up dull situations such as by making waiting and standing in line more enjoyable. Likewise, Dowling (2014) also discovered that school-aged children use humor as a way to cope with the various stresses of their personal relationships, school, extracurricular activities, and home life.

Recent research has afforded new insight into the benefits of including humor in educational environments for teachers. The study of Melenets et al. (2022), for instance, has shown that the use of humor is effective in improving teachers' emotional intelligence. Stenius Karlssona and Sivenius (2022) stated that the use of humor in education is a skill that can be learned and emphasized the importance of educators allowing and accepting humor specific to children. A recent study by Gültekin and Ulutaş (2021) has revealed that teachers find humor necessary in preschool education, but they need knowledge and experience in planning and implementing activities that support humor.

Based on these studies, it can be asserted that humor appreciation differs by age in the development process of the child, that humor provides significant benefits, and that it is important for adults to use humor elements (joking) suitable for children's humor development characteristics. One crucial aspect influencing children's development is the physical and social environment within which they interact. Tammemäe (2009) emphasized the significance of environmental conditions during the early years of a child's life, suggesting that these conditions may have a profound impact on their cognitive abilities. Consequently, it can be argued that fostering children's sense of humor entails organizing the physical environment using visual aids such as photographs, images, and cartoons that incorporate humor suitable for their developmental stage, as well as engaging in age-appropriate joking interactions with the child. In that regard, knowing the humor development can be rather beneficial in terms of providing opportunities to better know children and evaluate their development, allowing teachers to prepare humorous educational environments for children. Understanding the development of humor in children is an important area of research, as it has implications for their cognitive, social, and emotional development. Although previous work in the literature has employed various data collection methods, including natural observation (Loizou, 2005; Sahayu et al., 2021), analysis of pictures drawn by children that are funny to them (Yılmaz, B., & Tantekin, 2022), and identification of reactions to pictures shown to children (Guo et al., 2011), there is still a need for comprehensive investigations that incorporate cultural diversity. The present study addresses this gap by employing McGhee's theory of humor development as a guiding framework. McGhee's theory, built upon Piaget's theory of cognitive development, provides a solid foundation for understanding the progression of humor comprehension and expression in children. By investigating humor development in preschool and primary school children in Turkey, this study offers valuable insights specific to this cultural context.

Data collection involved recording children's laughter responses to a specially designed video material that encompassed the characteristics outlined in McGhee's theory of humor development, providing a measurable indicator of their humor comprehension and engagement. This standardized approach ensures consistency in data collection and allows for meaningful comparisons between age groups. This study holds significance not only for shedding light on the humor development of children in Turkey but also for providing an opportunity to examine the applicability of McGhee's theory of humor development across different cultural contexts. Ultimately, this study contributes to the broader understanding of humor development in children, providing empirical evidence in support of McGhee's theory and expanding its cross-cultural applicability. The findings will not only benefit researchers but also inform educators, parents, and practitioners in creating more engaging and effective learning experiences for children, taking into account their cultural backgrounds and individual developmental needs.

In this context, this research was conducted to determine at what age and how children attending preschool education institutions and primary school react to humorous situations prepared according to the stages specified under McGhee's humor development theory. It is believed that the findings of this research can contribute to identifying developmental characteristics at the universal level, as well as offering an idea about the developmental characteristics of children living in Turkiye. Additionally, its results can hopefully enable teachers to inspire and create fun-packed educational environments for children.

The research sought answers to the following question:

According to the stages in McGhee's humor development theory, which age group gives the strongest/weakest laughter response in each stage?

Research Methodology

General Background

The research utilized a single screening model, which is one of the widely employed general screening models. According to Karasar (2006), a single screening model is a research approach that involves determining the formation of variables one by one or based on quantity. The choice of employing a single screening model in this study was guided by the aim of examining the age at which children attending preschool education institutions and primary schools respond to humorous situations developed in accordance with the stages outlined in McGhee's (2002) theory of humor development.

Study Group

The study group consisted of 101 children, 49 girls and 52 boys, aged between 2-11 years. The children in the 2-6 age group were selected from a preschool education institution of a university in Antalya, Turkiye, while the children in the 7-11 age group were selected from among the children attending a primary school affiliated to the Ministry of National Education. The parents were educated about the scope and aim of the study at the meetings held by the researcher in the relevant schools, and parents were told that their children would be included in the study only if they granted their consent. A written consent was obtained from each family who allowed their children to participate in the study. The children whose families granted a written consent were also asked whether they would like to participate in the study, and only those who were willing to participate were included in the study. Thus, both families and children participated in the research on a voluntary basis.

Data Collection Tools

Video

First of all, McGhee's humor development theory stages were listed, and a script was written for the 2nd, 3rd, 4th and 5th stages of humor development, with at least two scenes for each stage. The script did not include examples of stage 0 and stage 1 because laughter in stage 0 did not contain humor, and in stage 1 children laughed at the attachment figure. In this scenario, all the scenes form a harmonious composition with each other. After this stage, opinions were received from a professor of developmental psychology, a professor of psychological counseling and guidance, and two child development specialists (PhD), who have academic studies on humor development, that the scenes in the scenario represent the stages in McGhee's theory of humor development. Adjustments were made in the scenario in line with the suggestions from the experts. Afterwards, in collaboration with the third-year students of the Cinema and Television Department, Faculty of Communication, a 5.01-minute-long video was shot by using the technical equipment belonging to these students. After shooting the video, the experts who were consulted about the video script in the beginning were contacted again and asked whether the scenes in the video effectively represented the stages in McGhee's humor development theory. Technical arrangements were made in accordance with their remarks. In addition, an expert (PhD) working in the field of music education was consulted in order to ensure that the background music used in the video was appropriate for the task. Table 1 lists examples of scenes representing each stage of McGhee's humor development theory in the video. These examples do not include all scenes; only one example is given to represent each phase.

Table 1
Scenes in the Video Representing the Stages of Mcghee's Humor Development Theory

Stage	Description of scene
Stage 2	The child puts the blue plastic container on his head as a hat and says, “Let me put on my hat first”.
Stage 3	The child takes the pink toy rabbit in the market and says, “Oh, a toy monkey”.
Stage 4	
4a	The child asks “Mom, what will we buy from the market?”. “Ice, rice, spice,” says the mother. (Example of playing with the sounds of words)
4b	The boy tells the waiter, “I want a huge book pudding over toy soup.”
4c	Mom says, “Okay, there would be an ice cream tree around here.” A red car parked without a right front wheel appears on the scene. It starts to rain, and the mother appears with an upside-down umbrella. There appears a cashier with a long and big nose. A dog enters the scene, and it meows.
4d	The mother says to her son, “It's too late, let's go to bed, Fatma”. (Fatma is a female name).
Stage 5	The waiter asks the mother, “Shall I cut your pizza into 4 pieces or 8 pieces?”. Mom says, “Let's cut it into 4 parts. I'm on a diet, so 8 pieces would be too much.”

Observation form

Research data were collected through semi-structured observation forms prepared by the researcher. In this observation form, the scenes in the video were listed in written form, and a space was left on the right column for each scene to make notes about children's laughter responses. The child's code, the child's age, date, time, scenes related to the stages in McGhee's humor development theory, laughter reaction during the first viewing, laughter during the second viewing other than laughter were written in this form. Each scene was considered an item, and thus a total of 27 items were included in the observation form. The part of the observation form containing the first three items is presented in Table 2.

Table 2
Examples of Items in the Observation Form

Video Code: Date: Time: Items related to scenes	Child's Code: Child's Age: First viewing Laugh/No laugh	Second viewing Laugh/ No laugh
The child puts the blue plastic container on his head as a hat saying, “Let me put on my hat first”.		
The child puts the shoes on his hands and says “Okay, I've put on my shoes, I'm ready”.		
The mother says, “I'll put on my shoes and then let's go out” and then puts the shoes on her hands.		

Research diary

The research diary is a notebook that the researcher uses to note any remarkable situations related to the research problem while the children are watching the video.

Data Collection

In order to collect research data efficiently, a room in the children's school was initially prepared in a way that it would not be affected by factors such as noise and movement from outside. There was nothing else in this room except for a laptop with a 13.3-inch screen, an additional speaker, a desk, and chairs for the children and the researcher.

After the adjustments in the room where research data would be collected, the researcher met the children under the supervision of their teachers. In this meeting, the researcher suggested the children watch a video, stating that he had contacted them upon the consent of their families. The children who accepted to watch the video were taken to the room prepared for video-viewing in groups of three.

After the children came into the room where they would watch the video, the researcher asked the children their names and put a name tag on their collars. Then, the children sat on chairs one meter away from the screen so that they could see the screen comfortably and watched the video. Children were recorded with the laptop's camera from the moment they entered the room to the moment they left the room. After watching the video once, the children were asked whether they wanted to watch the video a second time, and if they wanted, they were shown the video a second time. The reason for allowing children to watch the video a second time in the study was that there might be children who were not able to focus on the video during the first viewing. Children were told that they could return to their classrooms if they did not want to watch it a second time.

Since the video and sound recordings were taken by the laptop camera while the children were watching the video, no data was written on the observation form by the researcher, but if there was a situation that was not found in the observation form related to the problems of the research, the researcher took notes in the research diary.

Data Analysis

After the collection of the research data, the first and second records of each child group were followed by the researcher separately for each child in that group. During these observations, observation forms were filled using a code (number) corresponding to the names of the children. The filling of the observation forms was done by writing the children's reactions during the first and second viewing periods separately for each viewing order in the explanation field opposite the humor elements (examples) in the video in accordance with McGhee's humor development stages. Then, the data of the two monitoring forms for each child were combined, and the reaction of that child for the relevant stage was processed. Children's reactions to each scene, regardless of whether it was the first or the second viewing, were recorded as “laugh” or “no laugh”. In the observation forms, the data on whether the children laughed at the scenes according to McGhee's humor development stages were evaluated through descriptive analysis.

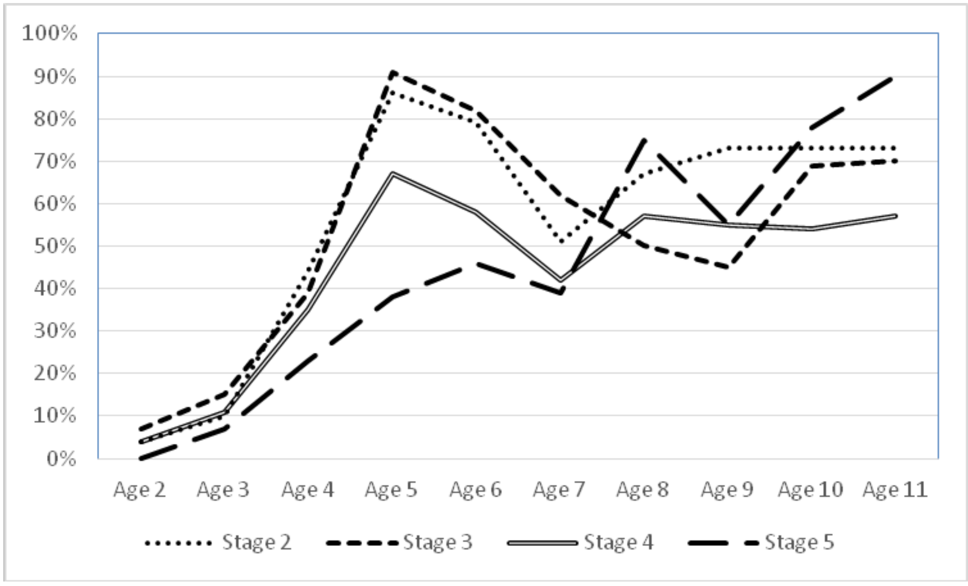
Merriam (2018) offered suggestions for increasing the validity and reliability of qualitative research, including using multiple researchers, multiple data sources and data collection methods to prove the accuracy of the findings, conducting interviews and discussions with experts about the research process and findings, Keeping detailed records about the practices and decision-making process, making detailed descriptions and descriptions of the environment, deliberately creating diversity in the selection of the working group. It is believed that the factors including the researchers getting expert opinions at various stages, keeping detailed records during the research, working with children from different age groups and schools, consulting with experts for their opinions during the research and data analysis, and producing detailed descriptions of the environment increased the validity and reliability of this study.

Research Results

Figure 1 below illustrates data regarding children's laughter reactions to video scenes.

Figure 1

Laughter Responses to Scenes Related to the Stages in McGhee's Theory of Humor Development



As seen in Figure 1, 5-year-olds were most likely to laugh at the scenes related to stages 2, 3, 4, while 11-year-old children responded to the scenes related to stage 5 with laughter. The least amount of laughter response was observed in children aged 2 and 3 for all stages.

The laughter response to the scenes of Stage 2 was most common in children aged 5 (86%). In children aged 7, there was a remarkable decrease in this rate (51%), but it increased again after the age of 7 and remained around 73% in those aged 9 and above.

The greatest amount of laughter response to the scenes related to Stage 3 was observed in children aged 5 (91%). Although this rate showed a notable decline in those aged 9 (%45), it climbed to around 70% after the age of 9.

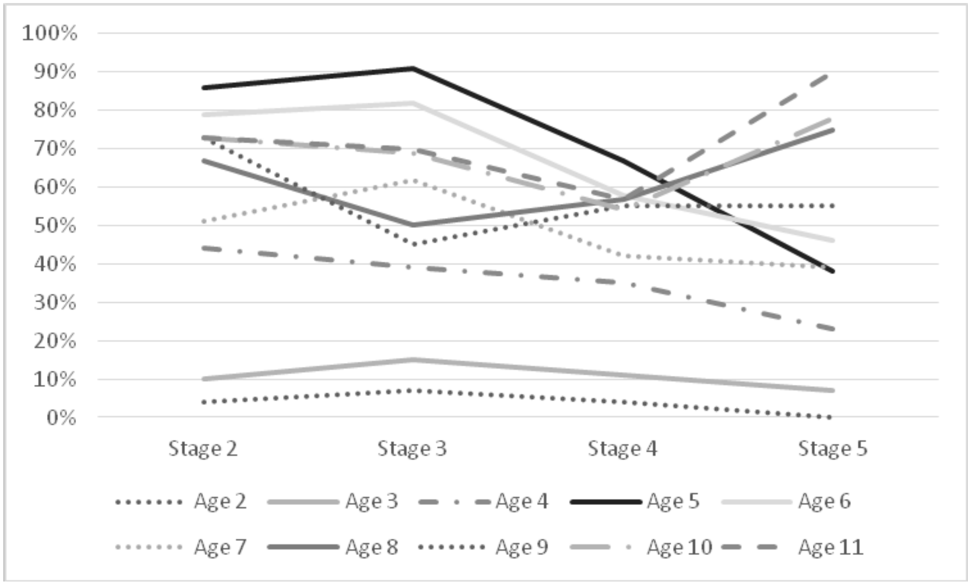
The laughter response to the scenes concerning Stage 4 was most pronounced at the age of 5 (67%). At the age of 7, however, there was a remarkable decrease in this rate (42%), and then it started to rise again towards the age of 8 and remained at around 55% after the age of 8.

The greatest amount of laughter response to the scenes relating to Stage 5 was observed in children aged 11 (90%). The laughter response to this stage was 78% for 10-year-olds and 75% for 8-year-olds. 39% of 7-year-olds and 38% of 5-year-olds responded by laughing to the scenes in Stage 5.

One of the remarkable findings in Figure 1 is that children's laughter response to scenes in all stages tended to increase with age up to age 5. At the age of 7, there was a tendency to decrease in the laughter reactions to the scenes related to stages 2, 3 and 4 compared to the age of 5.

The stages of laughter responses by children according to their ages are illustrated in the chart below.

Figure 2
Stages of Laughter Reactions Given by Children According to Their Ages



Among all age groups, 2-year-old children had the lowest amount of laughter responses. They showed some laughter response to stage 3 scenes (7%) but did not react at all to stage 5 scenes. Similarly, 3-year-old children had the strongest reactions to stage 3 scenes, but the weakest reactions to stage 5 scenes.

4-year-old children had the strongest reactions to stage 2 scenes, but the weakest reactions to stage 5 scenes. Children aged 5, 6, and 7 had the strongest reactions to stage 3 scenes, but the weakest reactions to stage 5 scenes. 8-year-old children had the strongest reactions to stage 5 scenes, but the weakest reactions to stage 3 scenes. 9-year-olds had the strongest reactions to stage 2 scenes, but the weakest reactions to stage 3 scenes. Children aged 10 and 11 had the strongest reactions to stage 5 scenes, but the weakest reactions to stage 4 scenes.

Discussion

The results revealed that the greatest laughing reaction to the scenes related to stages 2, 3, and 4 in McGhee's humor development theory occurred in children aged 5 years. McGhee (2002) states that in the humor development theory, 5-year-old children are among those who give the highest laughter response to stage 2 and 4 jokes. For this reason, it is only natural that the most laughing response was observed in children aged 5 years in these stages. In stage 5, the most laughter response was observed in 11-year-old children. According to McGhee's theory, the greatest laughter response to stage 5 scenes is seen in the period from age 6-7 to 10-11. From this point of view, it is expected that 11-year-old children will show the highest laughing response at this stage. However, it was observed that most of the children from the age of 8 laughed at the scenes in this stage. Stage 5 scenes contain adult humor and require a higher level of cognitive skills. Thus, participants in the 11-year-old group, the highest age group in the research, produced the greatest laughter response to the scenes related to this stage.

On the other hand, the least laughing response to the scenes in all stages was observed in children aged 2, 3 and 4, respectively. McGhee states that as they lack information about objects and words, toddlers may become sure of any incongruities only if they are the ones making such mismatches (as cited in Chaney, 1993). According to Loizou (2005), in order for children to enjoy the funniness of a humorous situation, they need to be aware of what this situation is and how it changes. Incongruity creates a “problem” in children's mind, and when they can solve this problem and thus use cognitive and mental processes, they can enjoy the humor created in the situation (Loizou, 2005). It is thought that the lower amount of laughter reaction in children aged 2, 3 and 4 stemmed from the fact that the children could not solve the problem in the humorous scenes and could not resolve the cognitive incongruity. In addition, since humor scenes are not presented in a natural environment in daily life, but artificially, through a video, it is thought that it is possible for children in this age group to have difficulties in perceiving the inconsistencies in the scenes.

The laughter reactions of the participants increased with age in all stages, up to the age of 5. This finding can be explained by the fact that cognitive development increases with age and children can notice incongruity in the scenes accordingly. In the study, it was observed that 7-year-old children's laughter reactions to stage 2, 4 and 5 scenes were less than the reactions of those aged 5. According to the findings of a study conducted by McGhee (1971) with children aged 5, 7 and 9, the least laugh response was observed in children aged 7 years. This finding is consistent with the results of our study. McGhee interpreted that this may be due to the fact that children at this age are between the preoperational and concrete operational stages. Rosenblatt & Winner (1988) states that children aged 6-8 tend to focus on the real and standard aspects of objects, facts, and events in their environment, adding that with the developing criticism and evaluation skills of children in this period, they limit objects (facts and events) with rules (as cited in Cropley, 2008). 2001). Accordingly, it can be asserted that the 7-year-old children in our study did not find the incongruous scenes in the video funny because they were under the expectation of real images of objects and events. In support of this, Morreal (1997) states that there must be a pleasant incongruity for laughter to occur.

Conclusions and Recommendations

According to the study findings, 5-year-old children demonstrated the highest levels of laughter when exposed to scenes from stages 2, 3, and 4. Among children older than 5, the 7-year-olds showed the weakest laughter reaction at all stages. On the other hand, those aged 11 exhibited the highest amount of laughter response in all five stages, but they laughed the most when exposed to scenes from stage 5. The weakest laughter response was observed among 2-year-old children as compared to other age groups.

The findings align with McGhee's theory of humor development. Derived from observations of children in real-life settings, this theory finds support in the reactions of children in Turkey to a specially designed video material that accurately represents the stages outlined in the theory. This compatibility strengthens the notion that the theory holds a universal nature applicable across different cultural contexts.

The study represents a pioneering effort in investigating children's humor development, offering a solid foundation for future research endeavors that employ a similar methodology. The data collection approach utilized in this study has the potential for larger-scale investigations involving a more extensive sample of children in all age groups, thereby yielding a more comprehensive data set. It is anticipated that the findings derived from larger study cohorts will contribute to the development of new assessment tools aimed at monitoring children's humor development. Such tools would likely prove valuable in future research endeavors focused on this area of study.

Replicating this study with larger samples from diverse cultural backgrounds will indeed prove to be highly beneficial, producing evidence that might help identify both universal characteristics and cultural variations in children's humor development. By examining how children of different cultures respond to the stages and stimuli presented in this study, we can better understand the influence of cultural factors on humor development and potentially uncover shared patterns or unique cultural perspectives.

This study collected data on laughter responses of children within a specific age range, but future research could employ longitudinal survey models to collect children's responses as they progress into later stages of life, as this would allow for a more comprehensive understanding of how humor development evolves over time and how individuals' responses to different humorous stimuli may change as they grow older.

The study revealed that among children aged between 5 and 11, 7-year-old children exhibited the lowest amount of laughter in response to the video scenes. To gain further insight, future investigations can utilize interview techniques to allow children in the 7-year-old age group to verbally express their thoughts regarding the video scenes. This approach would provide a deeper understanding of the reasons behind why these particular scenes are perceived as unfunny by children at this specific age, in contrast to younger and older children who find them amusing.

The research findings suggest that it could be beneficial to tailor educational materials and environments to the specific age groups of the target audience to enhance their humor quotient. By incorporating appropriate modifications based on the age group, such materials and environments can become more engaging and humorous, thus potentially enhancing the learning experience for children.

Note

This study is based on the master thesis prepared by the first author under the supervision of the second author.

Declaration of Interest

The authors declare no competing interest.

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Received: *April 27, 2023* Revised: *May 17, 2023* Accepted: *June 03, 2023*

Cite as: Eskidemir Meral, S., & Koçer, H. (2023). Humor development in preschool and primary school children in Turkiye. *Problems of Education in the 21st Century*, *81*(3), 374-387. https://doi.org/10.33225/pec/23.81.374

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 81, No. 3, 2023

THE USE OF CREATIVE DRAMA METHODS WITHIN KINDERGARTENS FROM THE PERSPECTIVE OF THE TEACHING STAFF

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Abstract

Creative drama has great potential and its implementation in education from pre-school education requires research, as evidenced by the number of scientific studies that have been registered in international research databases over the last ten years. The aim of the research was to examine the use of creative drama methods within kindergartens in Slovakia from the perspective of the kindergarten teaching staff (teachers and teaching assistants). A quantitative research design was used. 407 kindergarten teaching staff responded to the items of the questionnaire of the authors' construction. From the results of the research, it is possible to state that there is an average level of knowledge of creative drama among kindergarten teaching staff (based on their self-reflection). Furthermore, based on the self-reflection of the teaching staff, it can be stated that there are below-average opportunities for their education in the area of creative drama and a below-average level of using creative drama methods in kindergartens. Nevertheless, the status of the use of creative drama methods has improved over the last 10 years. The results of the research are a stimulus for further research - analysis of the responses of the teaching staff in terms of their age and pedagogical practice in order to estimate the development of the current state of using creative drama in kindergartens.

Keywords: *creative drama, creative drama methods, kindergarten teacher, teaching assistant, preschool education*

Introduction

In the professional literature, many definitions of the term creative drama may be found. A common feature is that it is about education aimed at the free and comprehensive development of a child's personality, in which the child using dynamic activities has the opportunity to perceive and learn about the external and internal world through its methods (Švábová, 2013; Rochovská et al., 2021; Rochovská, & Švábová, 2022). Furthermore, it is a creative process using all kinds of art - verbal, musical, movement, visual and dramatic (Brozmanová, 2020; Rochovská et al., 2021). The holistic development of the child's personality and the orientation to his/her uniqueness, self-development are emphasized. Education is perceived as a relationship of unique personalities (Lynch & Vargová, 2020; Vančíková et al., 2022).

A survey of the international online database Web of Science over the last ten years shows a number of studies focusing on creative drama in the context of a pre-primary education or the university training of pre-primary teachers, across the countries of Europe and the world; focusing, for example, on the importance of its application at this stage of school, and its benefits

https://doi.org/10.33225/pec/23.81.388

ISSN 1822-7864 (Print) ISSN 2538-7111 (Online)

for learners, such as developing creativity, eliminating behavioural problems, and promoting communication skills. It can be stated that the topics that have been explored in relation to creative drama are diverse. Dominant were the themes on creative thinking and developing creativity (Ahmadi & Nojabaee, 2014; Celume et al., 2019; Momeni et al., 2017; Ping, 2017; Po-Chi, 2016; Toivanen et al., 2013; Yaşar & Aral, 2012), and the theme on the impact of the application of creative drama on social (Azlina et al., 2021; Çetingöz & Gunhan, 2012; Öztuğ & Çiner, 2017; Ping, 2017; Tombak, 2014) and communication skills (Güleç & Macan, 2014; Özgür, 2018). Most of the papers that have been published in relation to the topic, and also included in the world database, were from researchers in Turkey (almost one-third), but there was also representation from Slovakia (Rochovská & Švábová, 2021, 2022), Czech Republic, Slovenia, Finland, Spain, France, Cyprus, China, Hong-Kong, Malaysia, and Iran.

Research has not only been carried out on children at a preschool age, but also on preschool pedagogy students (Danju, & Besim, 2020; Moral-Barrigüette & Guijarro, 2022; Öz et al., 2022; Yüksel et al., 2019). Several research studies have focused on the preschool teachers' views on the use of creative drama (Gursoy, 2019; Hornáčková, 2019; Rochovská & Švábová, 2021, 2022; Švábová, 2013).

Quantitative research, particularly pedagogical experimentation, has dominated. However, questionnaire-based exploratory research was also represented, especially in exploring the educators' views on the issue. None of the research, apart from the author's research (Švábová, 2013), specifically addressed creative drama methods and educators' views on their use in pre-primary education. For this reason, the research focused specifically on exploring the current state of the issue of creative drama within pre-primary education in Slovakia according to the views of kindergarten teaching staff, with a focus on creative drama methods.

Research Issue

The research issue was to explore the current state of the problematic of creative drama within pre-primary education in Slovakia according to the opinions of kindergarten teaching staff (teachers, teaching assistants). The research explored to what extent creative drama was represented in kindergartens and whether it was interwoven in all educational areas, which methods were most frequently used, how often and in which forms of daily activities. The research also explored the teaching staff's views on how creative drama influences the child's personal development and his/her emotional development within the kindergarten. At the same time, the research explored the awareness of educators about creative drama, and whether they are sufficiently familiar with it.

The Aim of the Research and Research Questions

The aim of the research was:

1. To find out the level of knowledge of creative drama among kindergarten teaching staff.
2. To find out the learning opportunities in the area of creative drama among kindergarten teaching staff.
3. To find out the teaching staff's views on the current state of the use of creative drama methods in the educational process within kindergartens.

The research questions were:

1. What is the level of knowledge of creative drama among kindergarten teaching staff? (The level of knowledge was understood to mean, in particular, the orientation of kindergarten teaching staff in the given problematic, the understanding of the concept of creative drama, and the understanding of the influence of creative

drama on the development of the child's personality and on his/her emotional life.)

2. What are the learning opportunities in creative drama for kindergarten teaching staff? (Learning opportunities are understood to mean the possibility of encountering creative drama on a professional level, and the possibility to draw on themes for the use of creative drama in practice.)
3. What is the current state of the use of creative drama methods in kindergartens? (The current state of the use of creative drama methods was understood to mean the self-reflection of the frequency of their use by teaching staff in the educational process, the self-reflection of the most frequently used creative drama methods, the types of puppets used, and the educational areas and daily forms in which specific activities with elements of creative drama are applied.)

Research Methodology

General Background

Since 2022, a national project called *"The Applying of Creative Drama Methods in the Process of Preschool Education"* has been implemented in Slovakia (Rochovská & Švábová, 2022; Švábová & Rochovská, 2023). The project focuses on the activating method of creative drama, pointing out its significant position and contribution to pre-primary education. The research within the project maps the situation in Slovakia regarding the application of creative drama methods in the self-reflection of teaching staff and indicates the opportunities provided by the current curriculum document for the application of the aforementioned methods. The project is also aimed at popularising creative drama among teachers and students - future kindergarten teachers. Both quantitative and qualitative research strategies are applied in the research project. The overall project duration is three years. The presented research is a partial output of the aforementioned national project.

Sample

The core group consisted of teachers and teaching assistants working in kindergartens within Slovakia. According to the Centre for Scientific and Technical Information, there were a total of 17,811 kindergarten teachers and 292 teaching assistants within Slovakia, in 2023. In calculating the sample size, the measurement error was set at 5%, the confidence level at 95%, the size of the base set at 18,103 and the response distribution at 50%. The calculated sample size (minimum recommended size) is 377 respondents. A total of 407 questionnaires were evaluated. Completion of the questionnaire was voluntary and was only completed by respondents who agreed to participate in the research. They could stop participating in the research at any time. Respondents were instructed that their answers were anonymous and would be a part of the statistical processing. All procedures performed in studies involving human participants were conducted in accordance with the ethical standards of the institutional and national research committee.

The characteristics of the sample are presented in Tables 1 and 2.

Table 1
Characteristics of the Sample

Gender	***N***	**%**
Female	404	99.3
Male	1	0.2
No response	2	0.5
Job position	***N***	**%**
Teacher	397	97.5
Teaching assistant	4	1
No response	6	1.5
Town/village kindergarten	***N***	**%**
Town kindergarten	230	56.5
Village kindergarten	166	40.8
Another response	4	1
No response	7	1.7
State/private/church kindergarten	***N***	**%**
State kindergarten	368	90.4
Private kindergarten	13	3.2
Church kindergarten	20	4.9
No response	7	1.7
Region	***N***	**%**
Bratislava Region	35	8.6
Trnava Region	23	5.7
Trenčín Region	37	9.1
Nitra Region	50	12.3
Žilina Region	60	14.7
Banská Bystrica Region	40	9.8
Prešov Region	93	22.9
Košice	67	16.5
No response	2	0.5

Table 2
Characteristics of the Sample in Terms of Age and Years of Teaching Experience

Age	
N	398
No response	9
Average	45.2
Standard deviation	10.7
Median	45
Minimum	20
Maximum	70
Years of teaching experiences	
N	401
No response	6
Average	21
Standard deviation	13.6
Median	20
Minimum	0
Maximum	50

Instruments and Procedures

The method of questioning was used to meet the survey aim. Data collection was done through a questionnaire which contained 10 scored items. In the first one, the respondents expressed where in their teaching practice they had the opportunity to professionally encounter creative drama. This was a multiple-choice question, with educators choosing from a) to g) or giving a different answer. The respondents were awarded 1 point for each answer, with a maximum of 8 points.

In the second item, they were asked to express their understanding of the concept of creative drama by choosing from options a) to h) or by giving their own answer. This was a multiple-response question. The respondents were awarded 1 point for each answer, including the answer “other”, i.e., a maximum of 9 points.

The third item explored the impact of creative drama on the child’s personality development and emotional life, according to the respondents. This was a multiple-response question and similarly, the respondents were awarded 1 point for each option marked, as in the previous item.

In the fourth item, the respondents expressed which methods of creative drama they used most often in their pedagogical praxis. This was a multiple-response question, with respondents choosing from a) to h) or giving another answer. They were awarded 1 point for each marked answer.

The fifth item asked respondents to comment on how they thought different methods of creative drama affected the children. This was a multiple-response question. They were awarded 1 point for each answer.

Based on the self-reflection of the respondents, the sixth item determined how often they used elements of creative drama in the educational process. This was a multiple-choice question, for which they were given points from the following options: a) every day in all daily activities in the kindergarten (5 points), b) every day in an educational activity (4 points), c) at least once a week in one of the daily activities (3 points), d) at least once a month in one of the daily activities (2 points), e) less than once a month (1 point), f) not at all.

The seventh item focused on puppets and their use in drama activities. The respondents commented on which ones they specifically used, choosing from a) to h) or giving another answer. They were awarded 1 point for each marked option. The “other” response was scored individually, with the possibility of receiving 1 point.

The eighth item asked respondents to indicate in which educational areas they applied elements of creative drama. This was a multiple-response question, with 1 point awarded for each marked response, including “other”.

In the ninth item, the respondents indicated, based on self-reflection, in which forms of daily activities they most often used creative drama within the kindergarten. This was a multiple-response question. The respondents chose from a) to e) or gave a different answer and were awarded 1 point for each marked answer.

In the tenth item, the respondents were asked to indicate where they got ideas for activities using creative drama methods. This was a multiple-response question. The respondents could choose from a) to f) or give another answer. They were awarded 1 point for each answer.

The research was aimed at exploring what the current state of creative drama in Slovakia looks like. It suggests that teachers and teaching assistants have encountered creative drama during their studies or in further education, how they are oriented to the subject, how they understand the concept of creative drama and reflect on its more frequent use, not only within several educational areas but also in several forms of daily activities. A summary of the thematic areas related to creative drama and the focus of the questionnaire questions arising from the research questions are presented in Table 3.

Table 3
Focus of the Questionnaire Items Resulting from the Research Questions

Questionnaire item number	Research question number	Focus of the item
1.	2.	Professional meeting with creative drama
2.	1.	The concept of creative drama
3.	1.	Creative drama and the development of the child's personality, their emotional life
4.	3.	Use of creative drama methods
5.	1.	The influence of creative drama methods on children
6.	3.	Frequency of using elements of creative drama in the educational process
7.	3.	The use of puppets in dramatic activities
8.	3.	The use of creative drama methods in educational areas
9.	3.	The use of creative drama methods in forms of daily activities
10.	2.	Drawing on ideas for activities

An exploratory factor analysis was used to determine the factor structure of the three variables. For the variable, "level of knowledge of creative drama among kindergarten teaching staff", based on exploratory factor analysis (principal axis factoring method, 1 factor, 63.8% variance), Cronbach alpha α = .809, item rest correlation: 0.64 – 0.743. For the variable, "learning opportunities in creative drama for kindergarten teaching staff", based on exploratory factor analysis (principal axis factoring method, 1 factor, 28.5% variance), Cronbach alpha α = .569, item rest correlation: 0.4. For the variable, "the current status of the use of creative drama methods in kindergartens", based on exploratory factor analysis (principal axis factoring method, 1 factor, 37.7% variance), Cronbach alpha α = .734, item rest correlation: 0.373 – 0.568. An exploratory factor analysis was used to determine the factor structure of the three variables (e.g., items related to self-reflection of the orientation in the problematic, interest in education within the area of creative drama).

Data Analysis

A data analysis was carried out in the statistical program Jamovi 2.3.2. Descriptive statistics (absolute frequencies, relative frequencies, mean, standard deviation, median, minimum, maximum) were used.

Research Results

Level of Knowledge of Creative Drama among Kindergarten Teaching Staff

Kindergarten teachers in Slovakia are partially familiar with the problematic of creative drama. Their partial familiarity with creative drama is in line with their answers concerning their understanding of the concept of creative drama. It can be stated that they did not understand the term in its full breadth and out of a total of 8 partial definitions (together with one other option), they marked only 3.8 of them on average (that corresponds to 42.2%). Taking into account the answers marked by the majority of the respondents, according to them, it is mainly a creative process using all kinds of art - verbal, musical, movement, visual, dramatic (80.6%), a complex of dramatic activities that can be applied in all of the children's daily activities (60.4%) and learning by playing through experience, mutual cooperation and communication (54.3%). Overall, the answers show that their understanding of the concept of creative drama varies. All of the definitions given in the questionnaire for item 3 refer to creative drama, but there was not one definition on which all the respondents agreed.

Similarly, understanding of the impact of creative drama on a child's personality development and emotional life can be described as average. Out of a maximum of six benefits of creative drama, the respondents on average indicated only 2.9 (that corresponds to 47.3%). Taking into account the answers marked by the majority of the respondents, according to them, creative drama helps children in the creative process to express feelings verbally and non-verbally, to formulate their thoughts clearly (82.6%), develops activity, creativity, collective feeling (69%), develops communication and sensory perception (65.1%). As in the answers to the previous question, developing creativity was particularly emphasised. Similarly, it can be noted that the respondents disagreed in their answers on the impact of creative drama on the development of the child's personality and each preferred different aspects of personality.

The quantitative expression of the variable "level of knowledge of creative drama among kindergarten teaching staff" is shown in Table 4. *M* = 9.95, *SD* = .13, *Mdn* = 10, Min = 3, Max = 20. Thus, an average level (47.1%) of knowledge of creative drama among kindergarten teaching staff (based on their self-reflection) can be stated.

Table 4
Variable "The Level of Knowledge of Creative Drama Among the Kindergarten Teaching Staff"

Item number	Item focus and scoring	*M*	Points min	Points max
2	Correctness of the definition of the term - all answers are correct, 1 point awarded for each marked answer	3.8	1	9
3	The impact of creative drama on personality development - all answers are correct, 1 point awarded for each marked answer	2.9	1	6
5	The amount of impact on children - all answers are correct, 1 point awarded for each marked answer	3.2	1	6
Total		9.9	0	21

Learning Opportunities in the Area of Creative Drama for Kindergarten Teaching Staff

The teaching staff had the opportunity to encounter creative drama at a professional level, mainly during their studies, especially at secondary school (57%), but also at university (46.2%). Out of eight options, they reported an average of only 2.4 (which corresponds to 30 %). They did not make sufficient use of continuing education opportunities (24.8%), methodological meetings (26.8%), conferences, seminars (15.5%) or self-study, reading the pedagogical press (30.5%). They mainly drew ideas for dramatic activities from the Internet (70%), and less from professional literature (55.5%). Of the seven options, on average, they marked only 2.7 (that corresponds to 37.6 %); they expressed little interest in drawing ideas from conferences, professional seminars, workshops (27.8%), and continuous education (25.3%).

The quantification of the variable "learning opportunities in creative drama for kindergarten teaching staff" is shown in Table 5. *M* = 5.05, *SD* = 2.11, *Mdn* = 5, Min = 1, Max

= 12. It can be stated that, based on the self-reflection of the kindergarten teaching staff, the training opportunities in the field of creative drama are below average (33.7%).

Table 5
Variable "Learning Opportunities in the Field of Creative Drama for Kindergarten Teaching Staff"

Item number	Item focus and scoring	*M*	Points min	Points max
1	Number of opportunities to meet with creative drama - 1 point for each marked answer	2.4	1	8
10	Number of options for drawing themes - 1 point awarded for each marked answer	2.7	1	7
Total		5.1	0	15

The Current State of the Use of Creative Drama Methods in Kindergartens from the Perspective of the Teaching Staff

Kindergarten teachers reported that of the methods of creative drama, the most frequently used were dramatization (83.3%), role play (77.1%), improvisation (73.7%), and puppet play (68.8%), with an average of 4.5 out of nine options for the aforementioned methods (it means 50 %). With regards to puppet play, the most frequently used were marionettes (91.2%), but also finger puppets (45.5%), glove puppets (42%) and stick puppets (31.4%) were also used.

The respondents said that they used creative drama methods at least once a week in one of the daily activities (40.3%). Only less than a third said that they used them every day in all activities within the kindergarten. Another less than a third of the respondents used them less than once a month. Among the forms of daily activities, almost all of them referred to an educational activity (94.8%) as an activity in which they apply the methods of creative drama. Half of them also mentioned games and activities chosen by the children, and less than a third of them mentioned health-related exercises.

The quantification of the variable "current status of the use of creative drama methods in kindergartens" is shown in Table 6. $M = 16$, $SD = 4.96$, $Mdn = 15$, Min = 1, Max = 32. It can be concluded that the current status of the use of creative drama methods in kindergartens from the perspective of the kindergarten teaching staff is lower than the average (42.2%).

Table 6
Variable "Current State of the Use of Creative Drama Methods in Kindergartens"

Item number	Item focus and scoring	*M*	Points min	Points max
5	Number of methods used in praxis - 1 point awarded for each marked answer	4.5	1	9
6	Frequency of use - scoring according to the explanatory notes in subsection 2.3	3.2	0	5
7	Number of different puppets used - 1 point for each marked answer	2.6	1	9
8	Number of application learning areas - 1 point awarded for each marked answer	3.2	1	8
9	Forms of daily activities - 1 point for each marked answer	2.1	1	6
Total		15.6	0	37

Discussion

The need to improve the quality of higher education and the competence of future teachers (Hulʼová, 2012, 2014; Miňová, 2021) is also related to the knowledge of different methods that the teachers know and use. Among the effective methods are undoubtedly activating methods (Droščák, 2014; Fedorko 2014), including creative drama.

The aim of the research was to find out the current state of the problematic of creative drama in pre-primary education within Slovakia according to the teachers' self-reflection. It can also be discussed whether there has been a shift in the area within Slovakia in the last 10 years, as there are results of similarly conceived research by one of the authors (Švábová, 2013).

Ten years ago, based on the results of the research (Švábová, 2013), almost half of the kindergarten teachers (from the Košice and Prešov regions) gained knowledge and experience in creative drama at methodological meetings and in the pedagogical press. Currently, only less than a third of teachers use these opportunities.

A decade ago, more than a third of teachers encountered creative drama at university. Now, however, nearly half reported this as an option, and most of them said they'd had professional encounters during their secondary school studies. Similarly, the research (Rochovská & Švábová, 2022) showed that kindergarten teachers had encountered drama mainly during their secondary school studies (45.1%) and less during their university studies (28.4%).

There has also been a significant change in the way we draw information about creative drama from the Internet. Whereas ten years ago this was only the case for around 10% of teachers, nowadays 32% of them have already expressed this opinion.

The situation in kindergarten teachers' orientation towards creative drama was similar ten years ago to today in that more than half of the kindergarten teachers still feel only partially oriented towards creative drama. However, there has been a shift in that whereas ten years ago as many as 8.33% of them reported that they did not feel at all oriented in this area, today only 0.5% of teachers reflect this way (Švábová & Rochovská, 2023).

The results are in line with the results of similar research (Rochovská & Švábová, 2022), which found that the self-assessment of kindergarten teachers' opportunities to acquire knowledge of the theory and history of dramatic arts is mostly good.

In terms of the methods of creative drama applied, and apparently preferred, by kindergarten teachers, both ten years ago and today, dramatization and improvisation dominate. The difference has been a decline in the application of interpretation and dramatic play. On the contrary, role-play, puppetry and pantomime are more preferred and used.

There has been a shift in the perception of creative drama as a method of education in the last 10 years. Whereas in the past only half of the respondents applied it as an educational activity (at that time an occupation, although the terms cannot be completely understood as synonymous), today almost all the teachers express their views on it. Ten years ago, creative drama was mainly used in leisure activities (57%). In addition, almost a third of teachers also used it in morning games. Today, more than half use it in games and activities of the children's choice. There has also been a shift in its use within health (at that time morning) exercises and being outdoors.

Ten years ago (in the Košice and Prešov regions), the use of creative drama methods was preferred mainly in rational (88%) and aesthetic education (76%), which corresponds to the current situation and the application of creative drama mainly in the educational areas of Language and Communication (93.4%) and Art and Culture (73.2%).

In physical education, 23% of the respondents from the Košice and Prešov regions expressed their opinion about the application of elements of creative drama ten years ago. Currently, the objectives and content of physical education correspond to the educational area of Health and Physical Activity. 31% of the respondents expressed their opinion on the use of creative drama in this educational area, which is a slight increase.

Ten years ago, only 4% of respondents from the Košice and Prešov regions expressed a preference for the use of creative drama methods in practical education. Nowadays, the objectives and content of practical education correspond to the educational field of Man and the World of Work. 22.6% of the respondents expressed their opinion on the use of creative drama in this educational area, which is also an increase.

Pro-social education was the third most frequently identified educational component (39%) in terms of the application of creative drama methods 10 years ago. Nowadays, prosocial education is part of the educational area of Man and Society, so it is not possible to make a complete comparison, as it includes several other sub-areas besides pro-social education. The educational area of Man and Society was identified by 44.7% of the respondents in our research as the area in which they use creative drama methods.

While ten years ago the answer “other” was given by up to 18% of the respondents, nowadays it is only 1% of the respondents, which means that the methods of creative drama have found application in the educational areas defined by the national curriculum. It was confirmed that both in the past and today, creative drama is mainly used as motivation.

The impact of creative drama on the development of a child’s personality and on his or her emotional life was investigated ten years ago in an open-ended question. In our current research, options were developed based on the respondents’ accounts and the literature on which the teaching staff commented. It can be stated that they agree with their views on creative drama as a means of developing creativity, communication, thinking, and a collective feeling. Ten years ago, the development of physical fitness and independence was also mentioned. Nowadays, moreover, the development of sensory perception has also been cited.

Although teachers mostly worked with practical titles, in 2013 they already pointed to the fact that there was a lack of literature and material in Slovakia that would inform them more professionally about creative drama. This was confirmed by the responses at that time, in which respondents marked that they had not encountered creative drama from the stated options.

The limitations of the research lie in the fact that the questionnaire was voluntary and was likely to be completed mainly by teachers who have a relationship with creative drama and felt the need to comment on this topic.

Conclusions

Creative drama harbours great potential and its implementation in education from the pre-primary school level requires research, as evidenced by the number of scientific studies we have found registered within the international citation database Web of Science over the last 10 years. The use of creative drama methods in kindergarten praxis depends upon the teachers, their competence, and their relationship towards creative drama. Therefore, research is warranted to explore the current state of its use at the national level, based on teachers’ self-reflection.

The significance of this research lies in the exploration of preschool teachers’ and teaching assistants' perspectives on the use of creative drama in kindergartens in Slovakia. Kindergarten teaching staff in Slovakia is partially familiar with the problematic of creative drama. Of the nine correct definitions of creative drama, on average, they considered only 3.8 as correct. Of the six correct characterizations of the impact of creative drama on the personality development of a child, on average, they considered only 2.9 as correct. Of the six correct characterizations of the impact of creative drama methods on a child, on average, they considered only 3.2 as correct. The research clearly confirmed an average level of knowledge of creative drama among kindergarten teaching staff (based on their self-reflection).

The teacher and teaching assistants pointed out only 2.4 opportunities, on average, to meet with creative drama, out of the eight possible opportunities. Of the seven possible answers, where they get ideas for activities using creative drama methods, on average, they marked only 2.7 of them. The research revealed below-average opportunities for their training in creative drama.

Furthermore, out of the nine possible methods of creative drama, the teachers and teaching assistants marked, on average, only 4.5 of them. Of the five maximum points for the frequency of use of creative drama methods in kindergartens they obtained, on average, only 3.2 of them. Of the nine possible opportunities – different puppets, they marked, on average, only 2.6 of them. Of the eight possibilities of application of creative drama methods in learning areas they marked, on average, only 3.2 of them. Of the six possible daily activities (in which they used creative drama methods) they marked, on average, only 2.1 of them. The research also revealed a below-average status of the use of creative drama methods in kindergartens.

Nevertheless, the status of the use of creative drama methods has improved over the last 10 years. The question is how the state of the use of creative drama in kindergartens will change in the next 10 years. The question can be partly answered by analysing the responses of teachers and teaching assistants in terms of their age and pedagogical practice. More intensive use of creative drama methods by younger teachers and teaching assistants could be a precondition for increasing their use in kindergartens over time. Using the example of research on the current state of the use of creative drama in Slovakia from the perspective of teaching staff, the research shows how the issue and its development over 10 years can be evaluated. It also proposes an analysis of the results in terms of the age of the respondents in order to find out the prognosis of the development of the issue.

Acknowledgements

The research was done as part of KEGA project No. 016KU-4/2022 "The Applying of Creative Drama Methods in the Process of Preschool Education".

Declaration of Interest

The authors declare no competing interest.

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Received: *May 10, 2023* Revised: *May 23, 2023* Accepted: *June 01, 2023*

Cite as: Rochovska, I., & Šbavova, B. (2023). The use of creative drama methods within kindergartens from the perspective of the teaching staff. *Problems of Education in the 21st Century*, *81*(3), 388-400. https://doi.org/10.33225/pec/23.81.388

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 81, No. 3, 2023

CHARACTERIZATION OF CURRICULUM LEADERSHIP BY SOUTH AFRICAN SCHOOL LEADERS AND TEACHERS IN ENVIRONMENTAL EDUCATION

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Abstract

Integrating environmental education into the school curriculum in South Africa remains a concern. Various curriculum and instructional design factors affecting environmental education have been explored. However, the role of curriculum leadership in environmental education is not well understood despite research that shows that curriculum leadership is a critical challenge facing the education system in general. Poor curriculum leadership has been shown to contribute to ineffective curriculum implementation and poor quality of education. In the current research, we used qualitative research methods to determine the characterization of curriculum leadership by teachers and school leaders involved in environmental education as a preliminary effort to understand the challenges facing environmental education. We used distributed leadership as a theoretical framework for the research. The findings show that some environmental education teachers, school managers, and environmental education subject advisors do not understand the concept of curriculum leadership. Participants' understanding of curriculum leadership was associated with socio-political dynamics rather than educational principles. We conclude that the poor understanding of curriculum leadership and its role may lead to ineffective integration of environmental education in the South African school curriculum.

Keywords: *Curriculum leadership; distributed leadership; environmental education; school leaders and teachers*

Introduction

Strategies for effective integration of environmental education have been extensively researched worldwide. In South Africa, researchers have raised concerns about the poor integration of environmental education and its insignificant impact on the everyday lives of communities and the environment (Zwelibanzi, 2016). Previous research identified several curriculum design, development, and implementation challenges affecting environmental education. For example, Le Roux and Maila (2004) suggested that teachers' and communities' generally poor understanding of environmental issues hampers environmental education efforts. This is because some teachers and communities do not understand the relevance of environmental education and therefore view it as an "add-on" rather than a core component of the curriculum. The government has also been accused of providing inadequate teaching and learning resources to support effective environmental education. Furthermore, there is a

ISSN 1822-7864 (Print) ISSN 2538-7111 (Online) https://doi.org/10.33225/pec/23.81.401

lack of monitoring and evaluation of the curriculum, including the extent to which schools adopt effective instructional strategies, such as a whole-school development approach to environmental education (Zwelibanzi, 2016). There are also reports of poor teacher training, curriculum coordination, and assessment of environmental education content.

Curriculum Leadership

While curriculum implementation issues have been identified, less effort has been made to understand the role of curriculum leadership in environmental education and how this may impact the curriculum's aspirations. Sorenson et al. (2011) defined curriculum leadership as integrating curriculum, instruction, assessment, and evaluation to improve learning and understanding to enhance the curriculum's quality, efficiency, and effectiveness. However, Harris and Jones (2020, p. 1) have cautioned that because the concept of curriculum leadership is not well developed, it is essential to ensure that curriculum leadership is not confused with other forms of educational leadership, such as "teacher leadership, instructional leadership, pedagogical leadership," "subject/disciplinary leadership" and "system/structural leadership." To this end, Henderson and Gornik (2007) argued that curriculum leadership ought to be transformative. In transformative curriculum leadership, curriculum leaders could be involved in the reconceptualization of educational standards, enacting systematic deliberations concerning instructional design and pedagogy, building communities of practice, and exercising public intellectual leadership (Kesson & Henderson, 2010).

In countries such as South Africa, curriculum leadership is vital to bring about social transformation envisioned in the constitution that seeks to redress the inequalities of the colonial and apartheid governments. As such, transformative curriculum leadership could play a crucial role in ensuring that education becomes a tool to foster transformation. Ylimaki (2011, p. 55) has suggested that such transformation may require critical curriculum leaders who are "concerned with dialectical relationships among suffering and oppression, curriculum content, cultural politics, and social inequities." This implied intersection between the curriculum, school, and society could empower learners to become change agents for social transformation.

Given the various leadership roles within the education system, one wonders about whose responsibility it is to "lead the curriculum." According to Ylimaki (2012, p. 305), some scholars have argued that curriculum leadership is the role of the school principal "as the top pedagogical decision maker in a school" (e.g., Harris & Jones, 2020). However, Ylimaki (2012) noted that a school principal could not be the sole curriculum leader because a curriculum is broader than teaching practice within the school environment. A curriculum includes other functions and factors that affect education, including sociocultural and political aspects of educational content decisions (Ylimaki, 2012). As a result, the role of curriculum leadership may be collaborative to include various stakeholders other than those involved in the day-to-day implementation of the curriculum. Thus, curriculum leadership should seek to promote and maintain quality curriculum design, development, and implementation encompassing learning, teaching, and the environment in which education takes place.

While quality education is often considered within the parameters of the schooling environment, Hallak (1996) argued that factors such as the changing ideological and socio-political landscape could significantly impact the quality of education. Hallak (1996) suggested that globalization and rapid scientific and technological developments impact how curricula are designed, developed, and implemented (Hallak, 1996). As a result, curriculum leadership ought to extend beyond school leadership to include these facets (Harris & Jones, 2020).

While the literature does not prescribe the role of curriculum leadership to any one individual, we posit that curriculum leadership should be a well-defined role within schools for effective curriculum implementation. Ideally, teachers and other stakeholders should adopt such a definition from literature and use it to develop school policy and delegate roles and responsibilities. However, the extent to which teachers and school leaders share a common understanding of curriculum leadership remains to be thoroughly investigated.

Distributed Curriculum Leadership

To address the question of responsibility, curriculum leadership may adopt a "distributed model of leadership where a key teacher may assume a role in the leading curriculum" (Harris & Jones, 2020, p. 1). In a distributed leadership model, curriculum leadership may be a responsibility of a group of individuals who work collaboratively to fulfil various functions leading to the design, development, and implementation of a high-quality curriculum. Leithwood (2005, p. 1) suggested that distributed curriculum leadership might involve "district administrators, teachers, parents, school board members, and state officials." In this context, curriculum leadership would require a strategic balance between pedagogical and administrative responsibilities in a multi-faceted and complex educational system.

Research has shown that distributed curriculum leadership is a significant driver in improving academic achievement. For example, in a distributed leadership model, curriculum leaders would be involved in the curriculum's design, development, and implementation. Their knowledge of student learning abilities and preferences would be used in curriculum design, development, and implementation. Additionally, curriculum leadership which involves researchers would ensure that decision-making in the curriculum is informed by relevant research (Coplan & Knapp, 2006).

King (2002) argued that distributed curriculum leadership, which focused on monitoring and evaluating learning and teaching, could help improve teaching methods and enhance student performance. This is because such leadership could provide supportive decisions about pedagogy, coursework, and instructional materials (King, 2002). Furthermore, research has shown that involving teachers in broader curriculum leadership is positively associated with enhanced engagement in continuous professional development for those teachers involved in curriculum leadership (Law & Wan, 2008). While the literature has shown a positive correlation between curriculum leadership and student performance, some scholars have argued that in a distributed leadership model, the impact of curriculum leadership may be too indirect and complex to be linked to student performance (Leithwood, 2005). As a result, further research may be required to understand the impact of curriculum leadership.

Curriculum Leadership in Practice

Various context-specific complexities could affect curriculum leadership in society and schools (Harris & Jones, 2020). For example, the devolution of curriculum leadership within the school to meet the context-specific demands of the school may be a strategic decision that aligns with the school's vision to harness the strengths of the staff (and possibly students) (Harris & Jones, 2020). However, in some instances, the socio-political dynamics of society could affect the viability of such curriculum leadership. Themane (2019) reported that some schools adopted a patriarchal approach to school and curriculum leadership in South Africa, partly due to the apartheid system and the colonial cultural practices, which regarded women as inferior to men. In such contexts, while the vision of distributed leadership may be ideal, it may not be viable or effective in practice.

Furthermore, research has shown significant knowledge gaps in teachers' understanding of curriculum leadership, which affects curriculum leadership in practice (e.g., Hsieh et al., 2021; Wang & Ho, 2020; Yang, 2019). A poor understanding of curriculum leadership and its relation to other governance and operational systems may also create confusion about the role of curriculum leaders. For example, in most communities, leadership and management have been associated with managerial positions (Harris & Jones, 2020). Anyone in a managerial position is often assumed to be a leader (Lunenburg, 2011). In distinguishing between management and leadership, Connolly et al. (2019) suggested that management may follow a hierarchical structure, where higher positions are perceived as having more power and authority. As such, curriculum leadership is often reserved for those in higher positions of authority (Connolly et al., 2019; Kaiser & Hogan, 2010). This is observed when curriculum leadership is associated with curriculum management (Ngobeni, 2011). In these cases, the curriculum is managed by 'managing teachers' and learners (Mngomezulu, 2015). The principals, deputy principals, departmental heads, and subject advisors all 'manage' the work teachers do in the classroom with learners as a perceived form of curriculum leadership. Such practices go against the basic definition of curriculum leadership.

Theoretical Framework

In the current research, distributed leadership theory was adopted as a theoretical framework to guide the research as we sought to understand how curriculum leadership is characterized in selected South African schools. Proponents of distributed curriculum leadership suggest that leadership is a social process that is not centralized in one individual. Instead, it is distributed among different stakeholders across the organization. Spillane (2005) argued that leadership involves broader organizational activities influencing motivation and strategic and operational practices. Thus, a leader should not be fixated purely on their position but on organizational objectives. Therefore, curriculum leadership should be decentralized in the same way that strategic and operational thinking is also decentralized. In this context, curriculum leadership requires collaboration and coordination from those involved.

A definition of distributive curriculum leadership includes curriculum activities tied to an organization's core functions that organization members design to influence and impact other organizational members' commitment, attitudes, and perceptions (Cooper, 2012). Therefore, Grenda (2011) suggests that the distributed leadership theory emerges from a reconceptualization of leadership, allowing for the integrated and collaborative approach to operations that benefit the curriculum. This also creates an environment where members of the organization work towards a common goal, such that the outcome is greater than the sum of their actions (Spillane, 2005).

In the school context, distributed curriculum leadership suggests that the principal should not be viewed as the absolute leader. Instead, various stakeholders should be viewed as collaborators in the curriculum leadership endeavour where each brings expertise to benefit the curriculum (Harris, 2005; Spillane, 2005). The principal, therefore, works in a team and retains his overall school oversight role (Grenda, 2011). However, the principal should acknowledge the synergistic relationships between stakeholders and structures that affect the curriculum for effective curriculum leadership. Team members in a distributed curriculum leadership context jointly recognize and enhance the skills and knowledge of all role players and create an environment that enriches human capacity (Connolly et al., 2019; Harris, 2005; Spillane, 2005). They also cultivate a system that cohesively integrates various aspects of the organization in a mutually interdependent and productive relationship (Harris, 2005).

Research Problem

The research gap explored in the current research concerns the characterization and role of curriculum leadership in environmental education. In particular, we noted in the literature that while factors affecting environmental education have been explored, the role of curriculum leadership has received little attention. For example, in South Africa, no formal school subject teaches environmental education exclusively. Instead, content is integrated into other subjects, such as Natural Sciences and Life Sciences. However, this means no one is accountable for the quality of environmental education teaching. Within the context of transformative curriculum leadership as defined by (Henderson & Gornik, 2007; Kesson & Henderson, 2010) and critical curriculum leadership (Ylimaki, 2011), we posit that it is unlikely that aspirations of environmental education will be achieved. In light of these challenges, the current research sought to explore the role of curriculum leadership in environmental education.

Research Aim

Given the broader research gap, the current study aimed to determine the characterization of curriculum leadership by environmental education teachers and school administrators in South Africa. This aim is a preliminary effort to understand the relationship between curriculum leadership and the effective integration of environmental education. The research question was, "*What is the characterization of curriculum leadership by environmental education teachers and school administrators in South Africa?*" Findings in this regard could help enhance the integration of environmental education in the curriculum, including curriculum design, development, implementation, and management.

Rationale

This research contributes to the international discourse on curriculum leadership by exploring how it is perceived in the South African context. The findings of the study can be useful for international scholars and policymakers to understand the challenges and opportunities of curriculum leadership in South Africa and potentially in other contexts. The research findings can also inform the development of training and professional development programs for curriculum leaders and policymakers in South Africa and other countries, particularly in the context of ongoing efforts to improve educational outcomes and enhance the quality of education.

This research is unique in the international context because it focuses on exploring the perceptions of curriculum leadership in South African schools. While there is a significant body of literature on curriculum leadership, most of it has been conducted in Western contexts, particularly in the United States and the United Kingdom. Therefore, this research provides a unique perspective on curriculum leadership in a developing country context, which has its own unique challenges and opportunities. Additionally, the research also highlights the need for a better understanding of curriculum leadership in South Africa, particularly in light of the country's ongoing curriculum reform efforts. By exploring the perceptions of curriculum leadership among South African educators, this research can contribute to the development of more effective curriculum leadership practices that are contextually relevant and responsive to the needs of South African schools.

Research Methodology

Background

The interpretivist research paradigm as defined by Guba and Lincoln (1989) to guide the research methods was adopted in the current study. Given its preliminary nature as an explorative study, the interpretivist paradigm allowed us to construct the meaning of underlying phenomena by interpreting reality as expressed through the participants (Kivunja & Kuyini, 2017; Morgan, 2007). As a critical inquiry, we relied on qualitative methods to interview participants. Data were collected and analysed over two years between 2021–2022.

Data Sources

Participants comprised three school principals, three teaches who were members of the school management team, three teachers who were not members of the school management team, two subject advisors, and three parents who were members of the school governing body. These participants were selected using non-random purposeful sampling criteria. In particular, we sought participants who were involved, in some capacity, in school management. Per regulations in South Africa, each public school ought to have a school management team and a school governing body. The school management team, which comprises mainly teachers, is responsible for the professional management of the school, which includes all activities that support teaching and learning (Heystek, 2004). The school governing body is an elected structure comprising mainly of parents. It is responsible for developing the school's strategic plan and related policies, including admissions and financial management policies.

Therefore, to understand strategies adopted for curriculum leadership to enable efficient environmental education in schools, we believed that members of the school management team and a school governing body should be selected as participants. The three teachers who were not members of the school management team, and two subject advisors, were identified for their roles in teaching content related to environmental education. The teachers taught Life Sciences, a subject in which most environmental education content is taught. The subject advisors are field specialists the government employs to oversee curriculum implementation, monitoring and evaluating the performance of teachers and learners in schools through quality assurance practices. We believe that understanding strategies adopted for distributed leadership to enable efficient environmental education curriculum management in secondary schools would require input from these participants as subject specialists and teachers, as well as those responsible for the overall governance of teaching and learning in the schools.

Data Collection

Data were collected using interviews through a Delphi method. As Barrett and Heale (2020, p. 68) described, "the overarching approach is based on a series of 'rounds,' where a set of experts are asked their opinions on a particular issue. The questions for each round are based in part on the findings of the previous one, allowing the study to evolve in response to earlier findings." These rounds are repeated until no new insights emerge, suggesting that respondents have thoroughly expressed their views. Through member checking, researchers also ensure that they have captured the respondents' views and meanings as best as possible. In the current research, the first round used pre-determined open-ended items (Table 1). The subsequent rounds were focused in confirming and exploring themes that emerged from the first round. Data saturation was reached in the third round, and no further data were collected.

Table 1.
A Summary of the Interview Protocols Used for Data Collection.

Theme	The focus of interview items
Description of curriculum leadership	Participants' description of curriculum leadership
Styles of curriculum leadership	Participants' knowledge of different styles of curriculum leadership
Roles of a curriculum leader	Participants' knowledge of the different roles of curriculum leaders
Understanding of distributed and transformational leadership	Participants' understanding of distributed and transformational leadership in curriculum management

Data Analysis

At the core of our data analysis was to verify themes with which we could respond to the research questions. To this end, a deductive approach was adopted where themes were identified from the literature. Subsequently, we collected and analysed data to determine whether the themes identified in the literature would be confirmed through our data. The data from the interviews were analysed through content analysis. As Holsti (1968) suggested, content analysis can be defined as a technique for making inferences by systematically identifying specific words, themes, or concepts within a given qualitative data set. Once these words, themes, or concepts have been identified, their meaning and relationship are determined through an interpretivist approach. In the current research, content analysis was preferred because it "provides a systematic and objective means to make valid inferences from verbal, visual, or written data to describe and quantify phenomena" (Downe-Wamboldt, 1992, p. 314). Downe-Wamboldt (1992, p. 314) suggested that content analysis "is more than a counting game; it is concerned with meaning, intentions, consequences, and context." It also allows the researcher to make inferences concerning the context from which data were produced.

In the current research, one researcher was responsible for interviewing the participants. This researcher was also responsible for data analysis. This ensured that the researcher as an "instrument for data collection and analysis" remained consistent. The other two researchers were responsible for quality assurance by determining the credibility of the data and the analyses. In particular, we used researcher triangulation, where multiple researchers reviewed the findings to check selective perception and illuminate blind spots in an interpretive analysis (Noble & Heale, 2019). As Carter et al. (2014, p. 545) suggested, "This type of triangulation can bring both confirmation of findings and different perspectives, adding breadth to the phenomenon of interest."

Research Results

Understanding the Roles of a Curriculum Leader

The participants were asked to describe a curriculum leader, including his/her roles. Data showed that none of the participants could provide a succinct definition of a curriculum leader. Instead, the participants used the role of the leader to describe what a curriculum leader was. As shown in Table 2, the participants suggested that a curriculum leader should understand the people and the environment in which they function. The leader must also guide and support his/her subordinates. Leaders are expected to listen to those they lead and lead by example. The participants described the curriculum leader's significant responsibilities as providing guidance, communicating reliable information, working collaboratively, and providing support.

Table 2
Participants' Description of a Leader

Participant	Current role in school	Participants' description of a curriculum leader
Mr. Mofolo	Subject advisor	A curriculum leader is "*someone who is able to guide, tell the truth, and listen to other people*." A curriculum leader must be someone "*who is able to work with other people. If there is a need for the truth to be told, it has to be told even if sometimes it hurts*".
Ms. Nkosi	Subject advisor	A curriculum leader is "*someone who will be able to guide and support subordinates*." A curriculum leader must provide guidance towards *a particular organizational goal*".
Mr. Mthunzi	School principal	A curriculum leader is someone *who "works with people, sets an example, understands people and the environment*." Such a leader would be expected to *"show people the way and show people what you expect by being exemplary*."
Mrs. Chetty	Teacher	*"Even though I am not in a leadership position, but I take leadership as someone that has to lead."* *"A* (curriculum*) leader is someone who is at the front then there are people who depend on you who are at the back."* As a curriculum leader, *"you should lead by example. The things that you say or do need to reflect what you say you are; that is my understanding".*

Leadership Styles

Participants were also asked to list the different curriculum leadership styles they were familiar with. In response to this question, participants listed different leadership styles (see Table 3) that they were familiar with, those they had experienced, and those they preferred. In some instances, the participants could define their leadership styles; in others, they were not.

Table 3
Leadership Styles and their Definitions Provided by Participants

Leadership style identified	Source	Current role in school	Definition provided
Democratic leadership	Ms. Nkosi	Subject advisor	This is where people listen to each other and come to an agreement.
	Mr. Mofolo	Subject advisor	Not provided
	Mr. Kim	Head of Department	I like the department to come up with ideas of how we can do things, guided by the department or school.
	Mr. Mkhungo	Teacher	Not provided
Autocratic leadership	Ms. Nkosi	Subject advisor	Not provided
	Mr. Mofolo	Subject advisor	Not provided
	Mr. Mkhungo	Teacher	The leader is taking all decisions that do not allow others to share their views. Like here in our school, there are so many things that they do that we are not happy with.
	Ms. Khumalo		There is no platform to share ideas because there is no need to suggest anyway because whatever the principal and SMT have decided will be done.
Authoritative	Mr. Mofolo	Subject advisor	Not provided
Coaching	Mr. Mofolo	Subject advisor	Not provided
Lase-fare	Mr. Mofolo	Subject advisor	Not provided
Collegial	Mr. Mofolo	Subject advisor	Allows everyone to be treated as a colleague. Collegial leadership can be applied through sharing power and ideas and by giving responsibilities and guidance when things are not going right. There are decisions that we cannot take because of our work situation. For example, if there is a curriculum outline, we cannot deviate from the curriculum.
	Ms. Khumalo	Teacher	I do not think there is anyone who would like to remain in a PL1 position.
	Mr. Mofolo	Subject advisor	Not provided
Instructional leadership	Mrs. Sydney	School principal	a leadership style whereby you aim to do the law of the institution to come up with strategies.
Instructional leadership	Mr. Mthunzi	School principal	Instructional leadership says what you promote at school is not only effective teaching and learning but the maximum "productive" teaching and learning. Instructional leadership informs that teachers have to be given opportunities to perform.
Batho pele leadership	Mr. Kim	Head of Department	It must be the learner first, parents, and visitors. I believe that when you are coming to the school, you come because you need assistance, and you might need to hurry somewhere else while I can still see the learners.
Distributed leadership	Mr. Kim	Head of Department	Not provided

Leadership Strategies for Managing School Curricula

Participants were further asked to describe strategies they use to manage the school curriculum. In response, Ms. Nkosi, a subject advisor, suggested that one of the strategies to manage curriculum is to *"allow teachers to participate in decision making, which gives you* *opportunities to get to know them better when you give them a role to play*." She indicated that she had applied this strategy when she *"called two teachers to the office and asked them to go and coordinate the workshop, and I gave them the materials I was going to use*." This way, teachers have the "freedom" to decide how the workshops will be run. These workshops would form part of teacher professional development activities. Regarding Ms. Nkosi's strategy, Mr. Mofolo, a subject advisor, suggested that he prefers to "*adopt a buy-in strategy where he would sell an idea to teachers and seek their buy-in."* He argued that *"if you come up with strategies to manage the curriculum and the teachers do not buy it, they will not do it. First, I show them how it can work for them".*

Mrs. Sydney, a principal, suggested that she rely on specific curriculum management tools. She stated, *"There are resources that we use, such as the one called a management or mentoring tool.*" These tools include technology-integrated curriculum management tools and other leadership structures available in the school. One such tool was reported by Mr. Mkhungo, who is a teacher. He indicated that "*the way they manage curriculum, they focus mainly on the ATP* (Annual Teaching Plan)*, so the ATP is what we use. In terms of work, we know the amount of work we need to cover".* Mr. Mkhungo further mentioned that they *"submit files to the HODs* (Heads of Departments) *so that they assess how far we have gone with work, comparing learner's books and ATPs."* The role of Heads of Departments was also mentioned by Mrs. Sydney, who indicated that "*we have HODs (we call them departmental heads) those are the ones managing the curriculum, and then a deputy principal manages the departmental heads work, then the principal manages a deputy principals work."* The existence of these stakeholders was confirmed by Mrs. Kubheka, who is a Head of Department. She indicated that the strategies to manage curriculum involve checking, *"teachers and learners work, every week, we have a circle of three days, one day is for submissions and that how we also submit to the principal."* Mrs. Kubheka, further indicated that as part of curriculum management, they *"sit down and plan, lessons and activities have to be the same, even if we are five, but our work does not have to differ, it has to be the same."*

Another Head of the Department, Mr. Kim, stated that "the only way to manage the curriculum is through what we are given by the department, then it depends on how we amend it because you have to check, the lesson plans, curriculum coverage, written work of learners to see if they have written enough work for a week, then it depends on what we have agreed on as a department." He further indicated that "teachers submit lesson plans every Tuesday, then we check curriculum coverage monthly."

Based on the data, curriculum management is distributed amongst different stakeholders. In this process, the Head of the Department seems to take the most responsibility for curriculum management. Ms. Nkosi, a subject advisor, suggested that her "role in managing curriculum would be to ask and invite teachers to come with ideas or give them different suggestions to manage" the curriculum. Mr. Kim argued that as a HOD, his "role in managing environmental education curriculum is that of an overseer."

Discussion

One of the significant findings of the current research is that the participants could not provide a succinct definition of a curriculum leader. Given the significance of curriculum leadership as discussed in the literature (e.g., Hallak, 1996; Jorgensen, 2016; Ylimaki, 2012), this finding is noteworthy as it may have significant implications concerning the role of curriculum leaders. The apparent lack of understanding of curriculum leadership supports Harris and Jones's (Harris & Jones, 2020) assertion that curriculum leadership is not well developed and generally not considered in teacher training. Perhaps, for this reason, participants could not define curriculum leadership. Instead, they described some functions of curriculum leadership using a generic definition of a leader. This confirms previous reports that curriculum leadership is often confused with general educational leadership (Jorgensen, 2016; Ylimaki, 2012).

It was also noteworthy that in defining the roles of the curriculum leader, none of the participants referred to the curriculum or instructional roles. Instead, the participants referred to providing guidance, collaboration, and supporting colleagues without explaining how these might be linked to the curriculum. The responses suggested that they may not be familiar with curriculum leadership, particularly concerning curriculum design, development, and implementation. These observations echo Tapala et al. (2021), who also found that heads of departments and other school managers perceived their roles as monitoring, motivating, role modelling, commitment, communication, goal setting, accountability, and personnel management. However, they could not identify with curriculum leadership concerning curriculum design, development, and implementation.

The current research also found that participants are aware of different leadership styles. However, we could not identify any related curriculum leadership. We also found that the leadership styles identified by the participants are related to social complexities, particularly socio-political dynamics, rather than the curriculum. For example, democratic, autocratic, authoritative, and *batho pele* leadership are concepts generally associated with socio-political dynamics. In South Africa, *batho pele* (which means *people first*) is an initiative introduced in South Africa by the Nelson Mandela administration to foster better service delivery. It also attempts to enhance the accessibility of government services, efficiency, and accountability. To our knowledge, this initiative has not been translated into the curriculum context. Therefore, we postulate that the socio-political dynamics inform this leadership view and may not be well defined within the educational context. Similarly, the other forms of leadership defined by the participants seem to reflect the socio-political dynamics and may not reflect curriculum leadership.

While the current research did not use transformative curriculum leadership as its framework, none of the participants in the current research see their roles within the context of transformative curriculum leadership (Kesson & Henderson, 2010). Our findings also confirm Themane's (2019) argument that curriculum leadership may be confused with general school management and leadership. Literature shows that school leadership and management are often associated with hierarchical managerial positions (Harris & Jones, 2020). Anyone in a managerial position is often assumed to be a leader (Connolly et al., 2019; Lunenburg, 2011). Our research noted that the participants do not see teachers as curriculum leaders or even leaders in general. Participants sometimes suggested that teachers can participate in curriculum and instructional design and development decision-making. However, as suggested by one participant, curriculum leadership is seen as the responsibility of the head of the department, who reports to the school principal.

It was also found that school governing bodies are not seen as part of curriculum leadership. In this regard, none of the participants mentioned the school governing body's (i.e., parents in particular) involvement in curriculum leadership. It is noteworthy that literature (e.g., Noble & Heale, 2019) argued that the role of the school governing body includes monitoring and overseeing the implementation of the curriculum in the school and ensuring that it is not disconnected from the school's goals. The school governing body represents the interests of ordinary community members, parents, teachers, and learners. Mahlangu (2008) also argued that the School Governing Body could decide on the instructional approach (curriculum implementation). Nevertheless, these responsibilities are not reflected in the South African Schools Act, No. 84 of 1996, as cited in the Guidelines for Capacity Building of School Governing Body Members 2018 (Department of Basic Education, 2018). Instead, the role of the school governing body is limited only to "supporting curriculum delivery" (Department of Basic Education, 2018, p. 15). The extent to which supporting curriculum delivery is a part of curriculum leadership was unclear.

Conclusion and Implications

The current research has demonstrated that curriculum leadership is poorly understood based on research findings. Given the benefits of curriculum leadership, we argue that a lack of understanding of curriculum leadership could lead to ineffective curriculum implementation, a phenomenon well documented in environmental education in South Africa. In this regard, we argue that environmental education will unlikely lead to significant societal transformation, such as adopting environmentally friendly practices. Based on the findings, it is argued that the roles of different stakeholders within the distributed curriculum leadership context require clarity. If the benefits of distributed curriculum leadership are realized, various stakeholders must understand what curriculum leadership is and how it should be implemented. It is argued that a lack of understanding of curriculum leadership within environmental education may be responsible for the poor integration of environmental education in the South African curriculum. Therefore, we recommend further research to explore the relationship between curriculum leadership and the effective integration of environmental education in school curricula.

The findings of this study have important implications for education policy and practice globally. Firstly, providing professional development opportunities for school leaders and teachers on curriculum leadership is necessary. School leaders and teachers need to understand the importance of their role in shaping the curriculum and how their leadership can affect its implementation. Secondly, school leaders and teachers must be equipped with the knowledge and skills necessary to effectively lead curriculum development and implementation. They need to be able to engage in collaborative decision-making with teachers and other stakeholders in the school community, including the school governing body, to ensure that the curriculum meets the needs of all learners. Thirdly, policymakers need to clarify the roles and responsibilities of the school governing body in curriculum leadership. The school governing body represents the interests of the school community, including parents, teachers, and learners, and should be involved in decision-making around the curriculum. Finally, future research should investigate how curriculum leadership can be more effectively integrated into education policy and practice. This could include exploring the relationship between curriculum leadership and student achievement and how curriculum leadership can contribute to more equitable and inclusive education for all learners.

Limitations of the Study

There are some limitations to the current research that should be acknowledged. In this regard, the sample size does not represent all teachers' perspectives on curriculum leadership in South Africa. Therefore, caution should be exercised in generalizing the findings to a larger population. Additionally, the research was conducted in only one province of South Africa. Therefore, the results may not apply to other regions of the country where different socio-economic, cultural, and political factors may come into play. Furthermore, the research only explored school leaders' and teachers' perspectives. Therefore, future research should consider including multiple stakeholders to provide a more comprehensive understanding of curriculum leadership.

Declaration of Interest

The authors declare no competing interest.

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Received: *March 29, 2023* Revised: *May 10, 2023* Accepted: *June 06, 2023*

Cite as: Shabalala, N. P., Hebe, H., & Mnguni, L. (2023). Characterization of curriculum leadership by South African school leaders and teachers in environmental education. *Problems of Education in the 21st Century*, *81*(3), 401-415. https://doi.org/10.33225/pec/23.81.401

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ISSN 1822-7864 /print/ ISSN 2538-7111 /Online/

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Editorial Board
Updated: July 2018
Website: http://www.scientiasocialis.lt/pec/

Problems of Education in the 21st Century, ISSN 1822-7864 (Print) ISSN 2538-7111 (Online)

Vol. 81, No. 3, 2023

Compiler Vincentas Lamanauskas
Designer Jurgina Jankauskienė
Paste-up artist Loreta Šimutytė-Balčiūnienė
English language proofreader Ilona Ratkevičienė

19 June 2023. Publishing in Quires 7,875. Edition 80.

Publisher Scientia Socialis Ltd. in cooperation with SMC „Scientia Educologica“
Donelaicio Street 29, Siauliai, Lithuania
E-mail: scientia@scientiasocialis.lt
Phone: +370 687 95668

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